FINAL CAUSES.

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FINAL CAUSES.

BY

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Translated from the French

BY

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With Preface by

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EDINBURGH

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1878.

AUTHOR'S PREFACE TO THE ENGLISH EDITION.

It is with joy and gratitude that I see my book on *Final Causes* presented to the English public by a scholarly writer, to whom I here present my best thanks for the care and talent with which he has applied himself to translate it. It has given me particular pleasure to be introduced in England by way of Scotland, that country of profound reason, where wisdom has always been mingled with a certain agreeableness and good grace commanding sympathy. The philosophers of that country—Adam Smith, Hutchison, Ferguson, Thomas Reid, Dugald Stewart, and even David Hume—have all, under different forms, that charm that comes from naturalness, candour, and mild and serious sentiments. In these authors there is entire scientific and intellectual liberty; and yet the soul is in security. They never wound it by insolence, hauteur, irony, or systematic intolerance. They always respect the instinctive beliefs. Their very doubt is amiable and respectful. In another order of ideas, the celebrated Sir Walter Scott, a great favourite in France, also represents that agreeable mixture of excellent and always strong sense with a sweet, varied, and cheerful imagination, whose graceful pictures have something very sober, clear, and penetrating. I think I find in that inimitable novelist the same qualities as in the historians and philosophers of Scotland. To be introduced into this noble country, into the midst of this family of amiable and respected minds, for whom I have always had so much sympathy, is an honour of which I keenly feel the value.

For the rest, I do not conceal from myself that it is mainly to the subject of my book that I owe this honour. Great Britain has always been the classic land of final causes. It is there that natural theology originated, has been developed, and has held its ground with honour down to our days. In our own age a great publicist and a great physiologist, Lord Brougham and Sir Charles Bell (both Scotchmen), counted it an honour to annotate the excellent work of Paley. Dugald Stewart, in his *Elements of the Philosophy of the Human Mind,* vindicated against Bacon the utility of final causes as a means of research, at least in the sphere of the natural sciences. What are called the *Bridgewater Treatises* have rendered popular, by a succession of scholarly studies, the argument drawn from design in nature; and recently, again, these remarkable works—the Duke of Argyll's *Reign of Law* and Professor Flint's *Theism*—have anew recalled attention to this famous and indestructible argument.

The present work is not altogether of the same kind as those of which I have just spoken. It is not a treatise of natural theology, but an analytical and critical treatise on the principle of final causes itself. Different times require different efforts. Philosophy has in our days assumed a new aspect. On the one hand, the development of the sciences of nature, which more and more tends to subject the phenomena of the universe to a mechanical concatenation; on the other hand, the development of the critical and idealist philosophy that had its centre in Germany at the commencement of this century, and which has had its counterpart even in Scotland with Hamilton and Ferrier; and, in fine, the progress of the spirit of inquiry in all departments, have rendered necessary a revision of the problem. The principles themselves must be subjected to criticism. At the present day the mere adding of facts to facts no longer suffices to prove the existence of a design in nature, however useful for the rest that work may still be. The real difficulty is in the interpretation of these facts; the question is regarding the principle itself. This principle I have endeavoured to criticise. I have sought its

foundations, authority, limits, and signification, by confronting it with the data and the conditions of modern science, as well as with the doctrines of the boldest and most recent metaphysics. If my book has any interest, it is in having set forth the problem in all its complexity, under all its aspects, without dissembling any difficulty, and in presenting all the interpretations. Apart from every conclusion, I think I can present it to philosophers of all schools as a complete treatise on the subject. Considered in this point of view, it will at least have, in default of other merit, that of utility.

Some modifications and, as I hope, improvements have been introduced into the English edition. The Appendix, somewhat too extensive in the first edition, has been relieved of certain portions of less useful erudition. Also two pieces, which likewise formed part of the Appendix in the French edition, have been introduced into the text itself, notably the last chapter of the second part (The Supreme End of Nature). By this transference the work has seemed to us to gain in force and interest.

PAUL JANET.

FORGES-LES-BAINS (SEINE ET OISE),
10th October 1878.

PREFATORY NOTE BY THE TRANSLATOR.

THIS translation has been undertaken on the recommendation of Professor Flint and others, who regard M. Janet's work as by far the ablest on the subject of Final Causes, and as well fitted to supply a lack in our literature. By an interesting coincidence, while our version was passing through the press, the following statement appeared in an influential newspaper of August 29th, in a letter from its French correspondent, the writer being in all probability unaware that an English edition was in progress :

'Will there not be found in British science a man of eminence to fight the battle of good sense and of the facts, against the monstrous imaginations of Darwin? If such a man comes out, he will find powerful assistants in our *Quatrefages*, our *Blanshard*, and our *Janet*. The book of this last one, on the *Causes Finales*, is really an event in science, and ought to have a large circulation among the educated classes abroad.'

The only changes that have been made on the original are that, by the Author's request, two notes in the Appendix (viii. and x.) have been incorporated in the text, and, with his approval, other two (vi. and ix.) have been omitted.

W. A.

PREFACE BY PROFESSOR FLINT.

THE publishers of this work having requested me to preface it with a few words of recommendation, I willingly comply with their desire, although convinced that scarcely any book has recently appeared which less needs extrinsic testimony in its favour.

The French original, which was published only in 1876, has already attracted to itself much attention, and all candid judges, whether accepting or not its conclusions, have warmly acknowledged its great ability and value. Although not an absolutely exhaustive treatise on final causes, seeing that it does not attempt to trace their presence in the regions of intellect and emotion, morality and history, it is the most comprehensive work which has been written on the subject; while the omission indicated, whether intentional or not, is perhaps one which could be amply justified. It is also a truly philosophical treatise, alike in conception, spirit, and execution. Truth alone is sought, reason alone is appealed to, and difficulties are neither evaded nor represented as less formidable than they really are; but, on the contrary, every serious objection, either to the existence of final causes in nature, or to the interpretation which the author would assign to them, is stated in its full force. Certainly no disposition is shown to exaggerate the weight or worth of the answers which are given to these objections. The general plan of the work is so simple, and the manner in which its argument is gradually unfolded is so clear and natural, that the reader is never left in uncertainty as to where he is or whither he is going. M. Janet possesses in a high degree the expository talent for which French writers are so distinguished. At the

same time, his earnestness and thoroughness as a thinker prevent his making any sacrifices to mere external graces, and hence he always writes as one who, having done everything to make himself intelligible to his readers, expects from them in return their whole attention.

The first of the two parts into which the treatise is divided deals with the problem, Are there ends in nature? In order to discuss this problem in a satisfactory manner at the present day, a man need not be a specialist in mechanical and biological science, but he must have an extensive and accurate general knowledge of such science, and an acquaintance with, and insight into, its history, methods, limits, and tendencies, which few specialists display. M. Janet possesses these qualifications in an eminent degree, and was well known to possess them before he wrote this work, in which they are so conspicuous. The possession of them had enabled him to intervene in the Materialistic controversy on the side of a spiritualistic philosophy more effectively perhaps than any other French thinker. The present work is the natural sequel of two admirable smaller writings, *Le Cerveau et la Pensée* (1867) and *Le Matérialisme Contemporain* (1875, 2d ed.). The latter has been translated into English and German. The second part of the present treatise deals with the problem, What is the ultimate cause or explanation of ends in nature? For its discussion speculative talent and an intimate acquaintance with modern metaphysics are demanded. The demand is, of course, met in M. Janet, whose life has been assiduously devoted to the cultivation of philosophy, and who is the author of works of acknowledged value in almost all its departments. French spiritualism has at present no abler or more influential representative in the Institute, the University, or the Press; and French spiritualism, although attacked from all sides,—by positivists, experimentalists, criticists, idealists, and mystics,—is still well able to hold its own, and at least as strong in men, principles, and services as any other school of French thought.

On a few points my views do not entirely coincide with those maintained by M. Janet in the present volume. It would be useless and ungracious, however, merely to indicate these differences, and it is impossible to discuss them within the limits of a preface. The argumentation as a whole commands my full assent; and while I should welcome any adequate attempt to refute it as not less valuable than itself, I have little expectation of seeing any refutation of the kind. There seems to be small hope of a work as comprehensive and thorough as that of M. Janet's being written from the opposite point of view, when even a critic of the talent of Mr. Sully can fancy that there is relevancy in such reasoning as the following:—'One or two observations on M. Janet's line of reasoning must suffice. We hardly think he will secure the support of men of science in limiting the action of physical or mechanical causation where he does. To say, for example, that mechanical principles cannot account for the symmetrical arrangement of the lines of a crystal, is surely to betray a rather superficial acquaintance with the mechanical mode of explanation. It seems much too soon, in view of Mr. Darwin's reduction of so many adaptations to a strictly mechanical process, to affirm that physical causation is inadequate to account for the orderly arrangements of living structures. We are, no doubt, still a long way from a mechanical theory of organic growth, but it may be said to be the *quæsitum* of modern science, and no one can say that it is a chimera. Should it ever be reached, one suspects, in spite of M. Janet's assurances, that ideas of final causes will soon wax very faint. For such a theory, while admitting that there is a close relation between organ and function, would be able to furnish another explanation of the relation, and M. Janet's argument, that what resembles the result of internal volition cannot be due to another cause, will hardly convince those who are familiar with the doctrine of the plurality of causes. The author seems to us to argue most weakly when he seeks to assimilate our knowledge of design in nature to

that of others' conscious thoughts and volitions. The independent chains of reasoning by which we are able to establish the existence of another mind, whether in one of our fellow-men or of the lower animals, serve as a mode of mutual verification, and to this there corresponds nothing in the teleological argument.'—*Mind*, No. 5, Jan. 1877, pp. 246–7.

Now, the central idea of M. Janet's book is that final causes are not inconsistent with physical causation. This idea he endeavours to confirm by an elaborate process of cautious reasoning, which extends through both parts of his work. In other words, the general aim of his whole treatise is to show that Mr. Sully's objection is irrelevant and inadmissible. This being the case, Mr. Sully was obviously bound in logical fairness to refute M. Janet's argumentation before urging an objection which takes no account of it whatever. It would 'betray a rather superficial acquaintance with the mechanical mode of explanation to say that mechanical principles cannot account for the symmetrical arrangement of the lines of a crystal;' but to attribute to M. Janet any saying of the kind is to show a wonderful capacity for misapprehending what he really says, which is, 'that the production of the crystalline forms of minerals *can be mechanically explained* by an agglomeration of molecules, of which each one has precisely the same geometric form as the whole,' but that the need of belief in thought or design is not thereby dispensed with, being still demanded by the very forms of the molecules and the co-ordinated action of the mechanical laws. M. Janet has taken great pains to show that those who are truly familiar with the doctrine of the plurality of causes will not oppose mechanical causes to final causes, or to a primary intelligent cause, and those who dissent from him must display their familiarity with the doctrine by proving that he is mistaken in this respect, and has not made good his conclusion. I do not wonder that Mr. Sully should think that M. Janet 'argues most weakly when he seeks to assimilate our knowledge of design in nature to that of others' conscious

thoughts and volitions,' for he clearly does not understand his argument. No man who does will fancy that there are any independent chains of reasoning by which we establish the existence of another mind, human or animal, to which nothing corresponds in the teleological argument. The evidences of design are our only evidences for the existence of other human minds. The use of spoken and written language, the production of machinery, the association of efforts, the co-ordination of actions, etc., are not independent chains of reasoning, but simply links in the one chain of inference from the evidences of design to intelligence, which is the only proof we possess that other men have minds.

Mr. Affleck has, it seems to me, done good service by his excellent translation of M. Janet's very able and important work.

R. FLINT.

THE UNIVERSITY OF EDINBURGH,
October 29, 1878.

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PRELIMINARY CHAPTER.

THE PROBLEM.

THE term final cause (*causa finalis*) was introduced into the language of philosophy by scholasticism.[1] It signifies the end (*finis*) for which one acts, or towards which one tends, and which may consequently be considered as a cause of action or of motion. Aristotle explains it thus: 'Another sort of cause is the end, that is to say, *that on account of which* (τὸ οὗ ἕνεκα) the action is done; for example, in this sense, health is the cause of walking exercise. Why does such a one take exercise? We say it is *in order* to have good health; and, in speaking thus, we mean to name the cause.'[2]

Let us examine closely the proper and singular character of this kind of cause. What characterises it is, that, according to the point of view which one occupies, the same fact can be taken either as cause or as effect. Health is without doubt the cause of walking, but it is also the effect of it. On the one hand, health only comes after walking, and by it. It is because my will, and, by its orders, my members, have executed a certain movement, that health has followed. But, on the other hand, in another sense, it is in order to obtain this

[1] Aristotle never employs it. He says, *the end* (τὸ τέλος), that *on account* of which (τὸ οὗ ἕνεκα), but never *the final cause* (αἰτία τελική). It is the same with other causes, which he always designates by substantives (ὕλη, εἶδος, ἀρχὴ κινήσεως). The scholastics transformed these substantives into adjectives: causa *materialis*, *efficiens*, *formalis*, *finalis*.

[2] *Phys.* lib. ii. c. 3.

good health that I have walked; because, without the hope, the desire, the preconceived idea of the benefit of health, perhaps I would not have gone out, and my members would have remained in repose. A man kills another: in a sense the death of the latter had as a cause the action of killing, that is to say, the action of plunging a poniard into a living body, a mechanical cause without which there would have been no death; but reciprocally this action of killing had as a determining cause the will to kill, and the death of the victim, foreseen and willed beforehand by the criminal, was the determining cause of the crime. Thus a final cause is a fact which may be in some sort considered *as the cause of its own cause;* but as it is impossible for it to be a cause before it exists, the true cause is not the fact itself, but its *idea.* In other words, it is *a foreseen effect,* which could not have taken place without this foresight.[1]

It is true it would be affirming a great deal, and perhaps transgressing the limits of experience, to require for every species of end an express foresight in the agent that pursues that end. We will take, for example, the phenomenon of instinct, where all evidence shows that the animal pursues an end, but without knowing that it does so, and without having previously conceived it in its imagination, nor yet the means, infallible although they be, by which it can attain it. Generalizing this difficulty, perhaps it will be said that even in rising to the first cause of the universe, one has no more reason to imagine it as an intelligence which foresees an effect, than as an instinct which surely but blindly tends to it by an intrinsic necessity.

We do not yet require to occupy ourselves with these pre-

[1] By carrying the analysis farther one can distinguish, with Hartmann (*Philosophie des Unbewussten*, Introd. chap. ii.), four *elements* in the final cause, —1st, the conception of the end; 2d, the conception of the means; 3d, the realization of the means; 4th, the realization of the end. Whence it follows that the order of execution reproduces inversely the order of conception; whence it follows, again, that what is last in execution (the end) is the first in conception (the idea of the end). This is expressed by the scholastic axiom: *Quod prius est in intentione ultimum est in executione.*

mature difficulties; let us merely say that to give a clear idea of the final cause, we must first represent it to ourselves in the most striking and most attainable case—that is to say, in the human consciousness. Diminish now progressively in imagination the degree of express foresight which controls the search for the effect, and you will by degrees arrive at that obscure and dull perception of which Leibnitz speaks, and which is nothing else than instinct itself,—at that sort of innate somnambulism, as Cuvier calls it, which presides infallibly over the actions of the animal. At a still inferior stage you will find the *tendency* of all organized matter to co-ordinate itself conformably to the idea of a living whole. The reflecting consciousness, then, does not exist, in fact, wherever we meet or think we meet with ends in nature; but only wherever we suppose such ends, we cannot prevent ourselves from conceiving the final effect as imaged beforehand, if not under an idealized and express form, at least in some manner in the agent that produces it. In order that an act may be called a final cause, all the series of phenomena required to produce it must be subordinated to it. That phenomenon which is not yet produced governs and commands the whole series, which would be evidently incomprehensible and contrary to every law of causality, if it did not pre-exist in some fashion and in an ideal manner before the combination of which it is at once the cause and the result. Resuming and correcting the definition given above, we may say, then, that the final cause, as given us in experience, is an effect if not foreseen at least *predetermined*,[1] and which, by reason of this predetermination, conditions and dominates the series of phenomena of which it is in appearance the result. Thus it is yet once more an act which may be considered as the cause of its own cause. Thus, in one sense, the eye is the cause of sight; in another sense, sight is the cause of the eye. We shall have

[1] Hegel himself thus defines finality: *das Vorherbestimmte.—Phil. de la Nat.* § 366. [The word finality—in French *finalité*—is used here and throughout this work not in its ordinary English sense, but to denote the fact, belief, or principle of final causes.—*Note by Translator.*]

to conceive, then, as Kant has said, the series of final causes as a reversal of the series of efficient causes. The latter proceeds by descent, the former by ascent. The two series are identical (at least it is permitted to suppose so *à priori*), but the one is the inversion of the other. The *mechanical* point of view consists in descending the first of these two series (from the cause to the effect); the *teleological* point of view, or that of final causes, consists in ascending it again (from the end to the means). The question is, Whereon rests the legitimacy of this regressive operation? It is known that all schools agree in admitting certain maxims or truths, called primary truths, primary or fundamental principles, which, according to some, are implanted *à priori* in the human mind, and, according to others, are the fruit of an experience so universal as to be practically equivalent to the innate, but which on all hands are recognised as so evident and so imperious that thought is absolutely impossible without them. These are such as the principle of identity, the principle of causality, and the principle of substance, the principle of space, and the principle of time. The simplest and clearest formulas which serve to express them are these: 'Nothing is at the same time, and considered under the same point of view, both itself and its contrary;' 'no phenomenon without cause, no mode without substance;' 'every body is in space, every event takes place in time.'

The question we have to resolve is this: Among these primary truths or fundamental principles, must we also reckon, as is often done, another principle called the *principle of final causes?* Is there a principle of final causes? What is it? What is its formula? Does it form one of those necessary and universal principles without which it is impossible to think? Or may it only be a particular case of one of them?

Let us remark, first, that men are not well agreed even upon the formula of what they call the principle of final causes. For the principle of causality there is no difficulty: 'No phenomenon without cause.' By analogy we should

have to formulate the principle of final causes in this manner: 'Nothing is produced without design; every being has an end.'[1] Aristotle expressed it thus: 'Nature makes nothing in vain.' We only need to express in these terms the principle of final causes to see at once that it is not of the same kind as the principle of causality. Th. Jouffroy, when examining, in his *Course of Natural Right*, the truths on which moral order reposes, says: 'The first of these truths is the principle that every being has an end. Equal to the principle of causality, it has all its evidence, all its universality, all its necessity, and our reason conceives no more exception to the one than to the other.' Despite the high authority of Jouffroy, we are obliged to declare that the principle here set forth, namely, that 'every being has an end,' appears to us to have neither the evidence nor the necessity of the principle of causality, namely, that 'all that is produced has a cause.' If by *end* is meant a certain *effect* resulting necessarily from a certain given *nature*, in this sense every being has an end, for every being necessarily produces what is conformable to its nature; but if by end is meant an *aim*, *for* which a thing has been made, or *towards* which it tends, it is not self-evident that the stone has an end, that the mineral has one. Doubtless, for him who regards nature as the work of a providence, it will be certain that all has been created for an end, and even the pebble will not have been made in vain; but then the principle of final causes is no more than a corollary of the doctrine of providence—it is not a principle *à priori*, a necessary, universal, first principle. The doctrine of a universal end of things, flowing from the doctrine of providence, cannot, then, be given as *self-evident*.

We must insist on this difference between the principle of causality and the principle of final causes. If I contemplate the chain of the Alps, and the innumerable strange and complicated forms which the peaks composing that chain have taken, the law of causality forces me to admit that each of

[1] To say, as is sometimes said, 'Every means supposes an end,' would be a pure tautology.

them, however accidental it may appear, has its determinate and precise cause; but I am in no way forced to admit that each of those forms, here pointed, there sloped, there rounded, has an end and an object. Take an eruption of a volcano: each stream of lava, each exhalation, each noise, each flash has its own cause, and the most passing of these phenomena could be determined *à priori* by him who knew accurately all the causes and all the conditions which have brought about the eruption; but to think to attribute to each of these phenomena in particular a precise end is absolutely impossible. For what end is such a stone thrown to the right rather than to the left? Why such an emanation rather than such another? These are questions which, in fact, no one asks. One might cite a thousand other examples: Why, to what end do the clouds driven by the wind take such a form rather than such another? Why, to what end does the malady called madness produce such a delusion rather than such another? To what end has one monster two heads and another none at all? There are a thousand such cases, in which the human mind seeks causes without concerning itself about ends. I do not merely say that it ignores them, I say it does not think of them, and is not forced to suppose them; while as to the causes, even when it is ignorant of them, it yet knows that they exist, and it believes in them invincibly.

Doubtless the human mind can apply the idea of finality even to the preceding cases, and, for example, believe that it is for an unknown end that there are mountains, volcanoes, monsters, and so on. I do not deny that it can, I say only that it is not forced to it, as it is in the case of causality properly so called. Finality in these different cases is for it only a means of conceiving things, a hypothesis which pleases and satisfies it, a subjective point of view, to which it can abandon itself, as it can refuse to do so; or else the consequence of a doctrine which is believed true. On the other hand, causality is a necessary law of the mind, an objective law of all phenomena without exception, a law necessary, and

everywhere verified by the constant reproduction of the phenomena under the same conditions; in a word, to employ the expression of Kant, finality in the examples cited is only a *regulative* principle, causality is always a *constitutive* principle.

Besides, even when we suppose that all the great phenomena of nature have their final causes, we only admit it for the phenomenon taken as a whole, but not for each of its details. For example, granting that there must be volcanoes, and that that is good, there will necessarily follow eruptions, which will bring about a thousand particular accidents; but has each of these accidents therefore its final cause? It is difficult to believe it. The general phenomenon being supposed useful, the causes which produce it must be endlessly reflected in a million little special facts, which only have worth and signification in so far as they make part of the whole, but which taken in themselves are only effects, and not ends.

To borrow a comparison from human experience: when by means of an explosive mixture we blow up masses of rock for the purpose of making our roads and railways, evidently the only thing which can be called an end is the general phenomenon of the explosion; but whether this explosion break the rock into a thousand pieces or into two thousand, whether those pieces are round, square, or pointed, whether they be hurled to the left or to the right, all that matters little to the engineer. These details only interest him in so far as they might affect the general phenomenon, or bring about this or that misfortune; but, his precautions once taken, no one can say that such an effect, taken by itself, is an end or an aim; and yet, once more, each of these accidents, however minute it may be, has a cause.

If there are in the universe a great number of phenomena which do not suggest in any manner the idea of an end, to compensate for this there are others which rightly or wrongly call forth this idea imperiously and infallibly; such are the organs of living beings, and above all of the superior animals.

Why this difference? What more is there in this case than in the previous one? If the principle of finality were universal and necessary, like the principle of causality, would we not apply it everywhere like the latter, and with the same certainty? There are none of these differences as regards efficient causes. In all cases we affirm that they exist, and we affirm it equally. There are no phenomena which are more evidently effects than others. We know the cause of them, or do not know it; but, known or unknown, it is; and it is not more probable in this case than in that. On the other hand, even those who affirm that there is finality everywhere, acknowledge that it is more manifested in the animal and vegetable kingdoms than in the mineral; and if one were reduced to the latter kingdom, and man were to forget himself, the idea of design would not, perhaps, present itself to the mind. One may see from this how much finality differs from causality; the latter is a principle, the former is probably merely the consequence of an induction.

A contemporary philosopher thinks, like Jouffroy, that the principle of finality has the same evidence as that of causality; he comprehends both together in one and the same formula. 'All that happens,' says he, 'not only comes from somewhere, *but also goes somewhither*.'[1] This proposition is doubtless indisputable, only, in so far as it is evident, it does not necessarily imply finality; and reciprocally, in so far as it might be understood in the sense of finality, it would no longer be evident. It is certain that a body in motion goes somewhere, but is the terminus of that motion a *result* or an *end?* That is the question. Is it as impelled or as attracted that the body goes somewhere? Or if it be impelled, is it by another body, or by a will which has an aim? All that remains in suspense, and that precisely is the problem. 'We conceive as necessary,' says the same author, 'that the cause includes,

[1] Ravaisson, *Report on the Philosophy of the Nineteenth Century*, p. 239. This principle appears to be translated from Plotinus: '*πάντι τῷ κινουμένῳ δεῖ τι εἶναι πρὸς ὃ κινεῖται*' (*Ennead*, v. 1. 6).

with the reason of the commencement, the reason also of the end to which the direction tends.' Again, nothing is more true than this proposition, but one can understand it as well in the sense of Spinoza as in the sense of Aristotle; the question always remains, whether the limit of the direction is contained in the cause as a *consequence* or as an *aim*, whether it is a *logical* development or a willed *foreordination*. And to say that the direction tends towards an *end*, is to beg the question.

For our part, we admit, with Aristotle, that 'nature does nothing in vain;' with Jouffroy, that 'every being has an end;' with M. Ravaisson, 'that every motion goes somewhere.' But these are only, as it seems to us, inductive truths, generalizations from experience. Seeing, as we do, in certain definite cases, very evident relations of means and ends, or which appear such to us, we proceed by extension to others which are less so, and thence to all the facts of nature, in virtue of our natural tendency to generalize. It is thus Aristotle formed the maxim: *οὐδὲν μάτην*; natural history having shown him a considerable number of facts where nature has evidently an end, he believed himself warranted to formulate that general maxim of which nature had furnished him with such frequent proofs.

Finality is not, then, in our estimation a first principle; it is a *law of nature*, obtained by observation and induction.[1] Just as the naturalists admit general laws, which are, as they say, rather *tendencies* than strict laws[2] (for they are always more or less mixed with exceptions),—the law of *economy*, law of *division of labour*, law of *connection*, law of *correlation*; so there is a law of finality which appears to embrace all the

[1] It will be objected that it is the same, according to the empiric school, with causality. But even supposing, with that school, that the principle of causality is itself a last generalization of experience, there would still remain a very great difference between the two principles—namely, that as regards causality every trace of the primitive induction has disappeared, and now there remains only a necessary law of the mind; while the principle of finality has not succeeded in incorporating itself in so complete a manner in the substance of thought: it remains matter of discussion, which is not the case with the law of causality, at least in its application, if not in its metaphysical sense.

[2] Milne-Edwards, *Introduction to General Zoology*, preface.

preceding laws, a tendency to finality, a tendency evident in organized beings, and which we suppose by analogy in those that are not.

In considering finality as a law of nature, and not as a rational law of the mind, we have the advantage, if we do not deceive ourselves, of averting the general prejudice of men of science against final causes. Why is it that men of science show themselves so opposed to final causes? It is because during long ages the principle of final causes has been made an *à priori* principle, which it has been sought to impose upon science as much as the principle of causality. Regarding everything, the man of science was required not only to state its cause, but also its end, as if he were bound to know it: by imposing on him the investigation of ends, he was turned aside from the investigation of causes. This is the yoke which the man of science cannot bear, because it deprives him of the liberty of inquiry. But if finality, in place of being an *à priori* law of the mind, is simply a tendency of nature, what prevents men of science from admitting such a tendency, since they admit others not less incomprehensible? And even, as we have seen, does not every idea of tendency in general already imply finality more or less?

If this proposition, 'Everything has an end,' is only an empirical generalization, more or less legitimate, it is evident it will not avail as a principle. From this point the question changes its aspect. Not knowing beforehand that everything has an end, how can we know in particular that *such a thing* is *an end?* By what sign do we recognise that anything is an end? If there is, then, a principle of final causes, it is not that which consists in saying that there are ends, but that which would teach us how to recognise an end, and how an end is distinguished from a result. This is the true problem. To affirm an end is to affirm a certain species of cause: in what conditions are we entitled to affirm this kind of cause rather than another? This is what we have to seek. The affirmation *à priori* of finality is a snare of the slothful

reason (*ignava ratio*). The problem is more delicate, and demands more deliberate inquiries. It will be the object of this treatise.

Before taking in hand the problem in the terms which we have just stated, let us again mention, in order to show their insufficiency, and to determine with precision the meaning of the question, certain formulas which have been given of the principle of finality.

Here is, for instance, how Reid expresses and formulates the principle of final causes: 'The evident marks of intelligence and of design in the effect, prove a design and an intelligence in the cause.' It is easy to see that there is not here a first principle, but a consequence of the principle of causality; it is a particular application of that scholastic axiom: 'All that is contained in the effect is contained in the cause,'—a principle which is not itself free from all difficulty. Besides, Reid's principle is expressed in a form which might be accused of tautology; for if there are in the effect marks of intelligence, it is a matter of course that this is the effect of an intelligence. But those who deny the consequence deny precisely that those marks from which intelligence is concluded are marks of intelligence; and it is this that has to be proved.

But the most important observation to be made on Reid's principle is, that the affirmation of intelligence is only a corollary of the principle of final causes, but is not that principle itself. When I shall have established that there are ends in nature, I shall thence be enabled to conclude that nature has an intelligent cause (yet there are philosophers, like Aristotle, Hegel, and Schopenhauer, who separate design from intelligence); but the true question is whether there are ends, and in what consist those marks of design which shall entitle us to infer, first, finality in nature, and then an intelligent cause of that finality. All these so distinct views, and which yet it is necessary to separate, are confounded in the axiom of Reid.

These distinctions, on the other hand, are clearly indicated in this formula of Bossuet, the best and most philosophical of all we know: 'All,' says he, 'that shows order, proportions well chosen, and means fit to produce certain effects, shows also an express *end, consequently* a formed *design*, a regulated *intelligence*, and a perfect art.'[1] It is evident that, in Bossuet's view, the principle contains two parts and two distinct affirmations: 1st, The existence of an express end, whose signs or marks are well-chosen proportions; 2d, The affirmation of an intelligence, of which the proof is derived from the existence of ends. Design, intelligence, art, are only affirmed as corollaries of finality. If there are ends, is there an intelligence? This question has to be debated with the advocates of an unconscious finality. If there are ends, by what are they recognised? This question has to be debated with the partisans of the blind mechanism of nature. Now, those two questions are very well distinguished by Bossuet. Besides, he sees clearly that the difficulty is precisely to know what is the sign of finality. He does not vaguely say, like Jouffroy, 'Every being has an end;' for that is what is in question. He does not advance a tautology, like Reid, 'If there are marks of intelligence, there is intelligence.' But he says, 'If there are proportions well chosen, proper for certain effects, there are ends;' and further, 'If there are ends, there is intelligence.' The formula, then, is excellent, and very solid. However, one might criticise some of its words. Is it true, for instance, that order always implies an end? That will depend on the sense given to the word *order*. What is better regulated than chemical combinations? Have they an end? That is what we do not know. There is no order more rigorous than the order of mechanics; yet it is a question whether mechanics belong to the domain of final causes. I do not wish to say that by pressing the idea of order one would not finish by eliciting from it the idea of finality, but these two notions are not equivalent in the first

[1] Bossuet, *Knowledge of God and of Oneself*, chap. iv. 1.

instance. Bossuet says, again, that all that shows *means* proper to produce certain effects, thereby shows an express end. One might accuse him here of tautology, for it is very true that the means suppose the end; but why? Because the means by definition is *that which serves for an end*, so that the question whether there are ends is the same as this, whether there are means. But if by means Bossuet simply intends, as is often the case, causes proper to produce an effect, then the principle is false, for such causes do not at all prove the existence of ends. For instance, the combination of oxygen and hydrogen is quite fit to produce water: it does not follow that nature in these combinations has had for its end the production of water: that remains to be proved.

Summing up, the final cause cannot be laid down *à priori* as a necessary condition of thought; it must be sought and established by analysis and discussion. That will be the object of this work.

This inquiry divides itself into two problems: 1st, Is finality a law of nature? 2d, What is the first cause of that law?

These two questions are quite distinct, and much obscurity arises from having confounded them. We will treat them separately in two different books.

BOOK FIRST.

THE LAW OF FINALITY.

CHAPTER I.

THE PRINCIPLE.

IF the principle of final causes were a first principle, and *à priori*, like the principle of causality, we would apply it everywhere and in all circumstances; but it is not so. In a very great number of cases phenomena appear to us to be without an end, or at least do not call forth the notion of an end; in other cases, again, this notion is produced with an imperious and irresistible force. Whence comes this difference? In what does the second case differ from the first? By what do we recognise that certain phenomena have, or appear to have, an end? Who warrants us to qualify them in this manner? To reply to this question will be to demonstrate the principle of finality.

It is a law of our mind, into the origin and metaphysical signification of which we do not inquire, that as often as a phenomenon appears to us in experience, we suppose for it an anterior condition, which we call its *cause* or its *reason*.[1] In whatever manner we understand the cause,—whether with some we see in it a power to act, or with others a simple phenomenon which precedes another,—in both cases, in all cases, it is an invincible law of the human mind to affirm that a phenomenon which appears in time supposes something without which it would not have existed. All the phenomena of nature, then, are linked by the bond of cause and effect.

However, we are not to believe that all these phenomena form a single indefinite chain, in which each phenomenon

[1] The distinction has been made, and should be made, between the *cause* and *reason* of a phenomenon. (See A. Fouillée, *Philosophy of Plato*, t. ii. p. 469); but this distinction is useless here. It suffices us to understand the idea of cause as it is understood in the sciences—namely, that which is required for the explanation of a phenomenon.

would come to occupy a place in its turn, and where there would only be room for a single phenomenon at a time. No; at one and the same moment there is an infinite number of phenomenal series, which take place at all points of the globe and of the universe. While we are here, at Paris, and the innumerable actions which constitute the life of a great city take place, at the same time there occur at London, at New York, and at the antipodes corresponding series of analogous actions. In one single town, each house, each street, each man is the theatre of particular scenes, infinitely diversified. These simultaneous phenomenal series are sometimes parallel, without immediate mixture with each other, and sometimes oblique, intersecting and traversing each other, and mingling their waves. Representing these phenomenal series by lines, we shall call the points where they meet points of coincidence, and the phenomena which result from their combination we shall call complex.

In certain cases it may happen that this meeting of serial lines is determined beforehand by the nature of things. For example, the flux and reflux of the sea, and the changes of the tides, coincide in a constant manner with the movements of the moon and the changes of the earth in relation to the sun; but it is not always so.

It sometimes occurs — often, even — that two series of phenomena happen to meet together, yet without our being able to say that they have any action upon each other; and it is even a pleasure to our mind to find out what will happen in this case.[1] For instance, if, in the game of *rouge-et-noir,* I bet that the black will win, and it wins accordingly, it is clear that my desire and my word could not have had any influence on the winning of one colour or the other, and likewise that the arrangement of the cards, which I did not know, could not have had any influence on the choice I have made. In this case two series of facts, absolutely independent of each other, have happened to coincide with each other, and

[1] The game of *cross purposes* corresponds to this disposition of the mind.

to harmonize, without any mutual influence. This kind of coincidence is what is called *chance;* and it is upon the very uncertainty of this coincidence that the pleasure, and, at the same time, the terrible temptation, of games of hazard rests.

It is right, in a sense, to say that there is no chance—that chance is a word void of sense, invented by our ignorance. Doubtless, if chance be considered as an actual entity,—as a sort of mysterious and jealous divinity, which, hidden behind I know not what cloud, blindly controls the threads of our destinies,—such a cause does not exist. No; chance is not a cause, but it is the coincidence of causes,[1]—it is an entirely external relation, but one none the less real, between independent phenomena. At every moment we employ chance to explain mysterious phenomena. Without wishing here to solve the so delicate question of presentiments, we may be permitted to suppose that in many cases the success of a presentiment is only the fortuitous coincidence of two series of independent phenomena. How many a time has one had presentiments which have led to nothing! but does a single one happen to coincide with the fact, the imagination is struck for the whole life. These are fortuitous coincidences, external, and without necessary connection, which one expresses by saying that they are the effect of chance. Again, without wishing to trench upon the so difficult question of magnetic clairvoyance, we may be allowed to think that in many cases chance has something to do with it,—the talent of the somnambulist seeks to limit that part, by trying to divine through some indications, or by resting on vague generalities. To have enabled certain false sciences—for example, judicial astrology or other deeply-rooted prejudices—to subsist so long, it is evident that some fortunate coincidences must have authorized in a certain measure those arbitrary inductions which have encumbered at all periods the imagination of men.

[1] See Cournot, *Dict. des sciences philosophiques*, art. 'Hazard:' 'Chance is the combination of several systems of causes which are developed each in its own series independently of the others.' The views developed by M. Cournot on chance, whether in this article or in his other writings, have been very useful to us.

Thus, in the case which we call chance or coincidence of causes, the product which is the effect of it needs no other explanation than that two series of phenomena have met and have concurred to produce it. It suffices that each of the phenomena of which this result is composed is explained by its respective causes; the principle of causality is sufficiently satisfied by this double or multiplied explanation. Suppose, on the one hand, that a carriage is dragged along with the utmost rapidity by a horse which has run off; suppose that, on the other, a man, preoccupied by his thoughts, and called to an appointment by an affair of urgency, hurries on without thinking, and is overthrown by the carriage: evidently I have no need of any particular cause to explain his fall, although clearly that fall was not necessarily connected with the blind rush of the horse. But, on the one hand that running off, on the other the preoccupation, are the two causes which, without meaning it, have produced that complex, unexpected effect. Doubtless by occupying a very elevated point of view, one may think that that event has been prepared and foreseen by the will of Providence, and that is usually what one supposes when it concerns the great ones of this world; as for the others, one is readily satisfied with proximate causes. But without in any manner contesting the idea of a particular providence, I will say that that is a very complex and altogether derivative idea, which ought not to appear in the analysis in which we are engaged.

Let us say, then, that with regard to coincidences that are rare and not numerous, whose component parts themselves are not numerous, and the coincidence of whose parts is the result of daily experience (like the meeting of two carriages rushing against each other[1]), in all these cases we have nothing to ask except, what are the causes which have acted on each side? But when those coincidences are repeated (as if it happened

[1] One must still further suppose a town where there are many carriages and much-frequented streets, which will greatly diminish the element of chance. It will, for instance, be much greater in a collision of two vessels on the sea.

that a coachman had often the misfortune to crush a passer-by), when they become more numerous or more complicated, and require a greater number of causes, it no longer suffices to refer each of the elementary phenomena to its respective cause; it becomes necessary, further, to explain the coincidence itself, or the multiplicity of coincidences. The more frequent the coincidences, the more numerous their component elements, the more our astonishment increases, and the less satisfied are we to see the coincidences explained by chance. If, for instance, in passing along a street I see a stone loosen and fall at my side, I will not be astonished, and the phenomenon will sufficiently explain itself in my eyes by the law of gravitation,—a law the effect of which has here coincided with the effect of a psychological law which has made me pass that way. But if every day, at the same hour, the same phenomenon is reproduced, or if at one and the same moment it takes place from different sides at once,—if stones are thrown against me from several different directions,—it will no longer suffice me to say that the stones fall in virtue of the laws of gravitation, but I will seek some other cause to explain the coincidence of their fall.

Not only common sense, but science also continually makes use of this principle — namely, that the repetition or the multiplicity of coincidences among phenomena is itself a phenomenon which must have its own cause. I shall give some examples of this. It is known that shells have been found on the tops of mountains, and Voltaire is known to have explained the presence of those shells by the passage of pilgrims going to Jerusalem, who used to carry shells in their hats. On this hypothesis, the presence of those shells on the Alps would be purely fortuitous. On the one hand, the pilgrims proceeding to Jerusalem, on the other, the Alps being their natural road, it is not astonishing that these two causes coincided; and one of the accidental effects of this coincidence might have been the dropping and leaving of some shells. This explanation would suffice if there had only been a small

number of them. But the number of them is so great that the explanation proposed by Voltaire does not suffice; for what is to be done is not to explain how one shell came to be found on the Alps, but how heaps of shells are met with there. It is the number of the coincidences which science ought here to explain, and this she does by saying that it is not by chance that those shells are found on the mountains, but by a determinate cause, which is the presence of the sea in elevated regions. For a like reason the presence of the elephants found amid the ices of the north is a proof, according to Buffon, of the revolutions of climate which have taken place in those countries. 'The vast quantity of them that has been already found in those almost desert lands, where no one seeks them, suffices to demonstrate *that it is neither by a single or several accidents,* nor at one and the same time, that several individuals of this species have been found in those countries of the north, but that it is a case of absolute necessity that that species existed there at one time, subsisted and multiplied, as it does at the present time in tropical countries.'[1]

Example second. In recent times the phenomenon of shooting-stars has been much studied. Now, observation has established that this especially takes place at certain periods of the year, in August and November. At these periods the falling stars are so numerous that they have been compared to rain, and are called *heavy showers.* The natural philosophers and astronomers have not regarded as an indifferent circumstance this specially abundant production of the phenomenon at a determinate period. They have therefore imagined that at this period of the year the earth crosses a vast ring composed of asteroids, which, drawn into the terrestrial orbit by attraction, are precipitated towards the earth. Besides, numerous showers having coincided in these recent times with the absence of an expected comet, the comet of Biéla, it has been supposed that they were the fragments of it. Whatever be the worth of these hypotheses,

[1] *Natural History:* 'Epochs of Nature.'

it is evident that they have their reason in that law of our mind which requires of us not only a cause for each particular phenomenon, but also for the agreement and coincidence of phenomena.

Considerations of the same kind have brought astronomers to think that the stars are not cast by chance over the extent of the firmament, but that they form groups and systems, and are in a reciprocal dependence. Arago, in his *Popular Astronomy*, explains to us this mode of reasoning:

'Every one will understand,' says he, 'that in examining the probability that stars scattered through the firmament without any rule will appear in groups of two,—that this probability, we say, will be so much the less as the groups in question are to have the less dimensions. It is, in fact, as if one calculated the chance that in throwing a certain number of grains of wheat on a chess-board, they shall be found united in the squares by groups of two; the chances must evidently diminish along with the dimensions of these squares in the proposed problem. The grains of wheat are stars, the chess-board is the firmament. The squares for Herschel's first class are spaces of at most four seconds in diameter; for the fourth class, the dimensions of the squares ascend to thirty-two seconds. On the hypothesis of an absolute independence between all the stars which are scattered like seed over the heavens, the first class of double stars would be much less numerous than the second, the third, and, above all, the fourth. But the case is exactly the contrary. Thus, then, we are brought by simple considerations of probabilities to recognise that the stars, which are neighbours to each other, are not so merely in appearance, that is to say, by an effect of optics or of perspective, but that they indeed form systems.'[1]

The same principle, the same need of the mind, conducted Laplace to his celebrated hypothesis on the origin of our solar system. Starting from this consideration, which, besides, had already struck Newton, Kant, and Buffon,—namely, that all the

[1] Arago, *Popular Astronomy*, Book X. chap. xix.

stars which compose that system have their motion, whether of rotation or of revolution, in the same direction (from east to west), which yields, Arago tells us, forty-three motions co-ordinated in the same direction; and that, besides, all those stars are found placed nearly in the plane of the ecliptic,—Laplace thought that such an arrangement could not be the effect of chance, and must have a determinate cause. Buffon had already thought so, and had tried to explain our system by the hypothesis of a comet having fallen on the sun, and whose pieces, becoming planets, had been drawn by the solar attraction. Kant, in his *Natural History of the Heavens,* likewise proposed a hypothesis to explain the same phenomena; and this hypothesis is analogous to that of Laplace. The latter, as is known, thought he solved the problem by supposing that the planets originally made part along with the sun of one and the same *nebula,* actuated by a rotatory motion, which, being broken in consequence of refrigeration (a circumstance which has become doubtful since the new theories on heat), would thus have given birth to distinct bodies, actuated by the same motion as the primitive *nebula.* And thus the prodigy of forty-three motions co-ordinated in the same direction would be explained in the most natural manner by the partition of the primitive motion. Whatever may be the intrinsic value of this explanation, the essential lines of which still endure even now, the chief point to notice is that in this case, as in those preceding, every co-ordination, every repeated coincidence, is always considered by men of science as calling for a special explanation. Supposing that we do not admit this principle, namely, that the frequency of coincidences between phenomena is itself a phenomenon which must have its cause, none of the preceding discoveries or hypotheses would have been made. Given to explain the presence of shells on a mountain, the chance passage of a pilgrim suffices for it; given the fall of a shooting-star, the chance meeting of the earth with an asteroid is enough; given any arrangement whatever of stars in the heavens, of planets in our system, the same general unknown

cause, called the initial cause by men of science, can explain that distribution. It is, on the other hand, because it has not been believed that a regular arrangement could be the effect of chance, that men have been led to these discoveries or hypotheses — namely, the presence of the sea on high mountains, the periodic meeting with a ring of asteroids, the arrangement of the stars in groups and systems, the division of a primitive *nebula*, and so on. What is explained by these hypotheses is not *a certain special phenomenon*, but *a concordance or repetition of phenomena.*

Let us add, that induction itself, which has so much embarrassed logicians, has no other principle than that which we have just enounced: any constant repetition of phenomena must have a constant and determinate cause, and cannot be the effect of chance; which we translate by saying, it is a law of nature. What is the difference between this certain proposition: Water boils at a hundred degrees [centigrade]; and this other proposition: An eclipse is a presage of public calamities? The difference is, that in the first case the coincidence of the two phenomena is constant and without exception; and that, in the second case, the coincidence does not always occur. Now, chance may well bring about sometimes, and even often, a coincidence between an eclipse and an event so frequent as public misfortunes are; but reason refuses to admit that chance brings about a coincidence that is constant and without exception. That coincidence itself must have its *raison d'être;* the reason is, that the one of those phenomena is the cause of the other, or else that the two phenomena have a common cause.[1]

However important the principle which we have just established may be for the solution of the problem which we have proposed to ourselves, yet we must not believe it is the very solution which we are seeking.

In effect, in the examples cited, we see a certain co-ordination—indeed a harmony, a frequency of coincidences; but

[1] See the appendix, Dissertation I., *The Problem of Induction.*

we do not yet see final causes. One is too much disposed to believe in general that there is no medium between chance and finality, and yet it is there precisely that the *nodus* and difficulty of the problem is found. It is certainly not by chance that there are shells on the Alps; but for what end are they there? what purpose do they serve? That is what is not apparent. We shall, therefore, have sufficiently explained their existence by determining the physical cause which has brought them there, and this cause is the presence of the sea. It is not by chance that the meteoric stones fall at a certain period of the year; but why and to what end do they fall? This is what no one could tell, and no one thinks of it. It suffices to have explained the frequency of the falls by the presumed meeting with a chain of little stars. It is not by chance that the stars are concentrated in certain points of the sky more than in others, or that the planets revolve in the same direction as the sun, or in the same plane as the ecliptic; but to what end is that so, and has it an end at all? This is what is not asked, or at least it is permitted not to ask it. If there has been found a sufficient physical cause to explain these remarkable arrangements, it seems as if there were nothing more to seek. Such is at least the first appearance of things, and perhaps we will find later that it is only an appearance;[1] meanwhile nothing hitherto shows us a finality, and if there were not other facts in nature, perhaps one would not go farther.

Still, while quite recognising that the preceding principle is not yet the principle of final causes, let us not think that we have not made an important step towards the solution of our problem. We have, in fact, obtained and established this result, that the human mind requires a cause not only in order to explain phenomena, that is to say, that which strikes the senses, but also in order to explain what does not strike the senses, namely, the order of the phenomena. When it is said, 'No phenomenon without cause,' one does not exhaust

[1] See in the sequel, chap. v., *Mechanism and Finality.*

the force of the principle of causality; for the order of the phenomena is not a phenomenon. That order is only grasped by the mind; it is an intelligible relation between the phenomena, of which, however, we seek the explanation quite as much as of the phenomena themselves. Take the fall of a stone, it is explained by the law of gravitation; let there be a second fall, it is explained by the same law. But let there be a hundred falls occurring at the same moment from opposite directions in space, although there is in this case only a hundred phenomena of the same order, and nothing more, for the senses, yet these hundred falls will no longer admit of being explained by the repetition a hundred times over of one and the same cause; and a mind which should not be capable of remarking this agreement of phenomena, and which should continue to explain them indefinitely by the same cause, would on that very account appear to us struck with imbecility.[1] But yet one more; what is there here more than in a hundred separate falls? Nothing but their convergence or simultaneity —that is to say, something intellectual.

Thus the invisible agreement of the phenomena behoves itself to be explained like each visible phenomenon taken separately; this co-ordination is an effect which must have its cause. For example, the geometrical form which minerals take in crystallizing may not, indeed, reveal any final cause; but no one will venture to say that this geometric arrangement is an indifferent fact of which it is useless to seek the cause, and that it is by chance and by a simple coincidence that the molecules of such a mineral always happen to arrange themselves under the form of a hexahedron, of a dodecahedron, for that which happens in a constant manner cannot be the effect of a mere accident.

[1] It would be with it as with that man of whom Gassendi speaks, who, half-asleep, and hearing four o'clock strike, said, This clock is mad; lo, four times in succession it has struck one o'clock. The man had not force of mind enough to reflect that four times one o'clock make four o'clock. Those who explain the world by a fortuitous concourse of atoms give evidence of a power of synthesis about equal to this.

However, in order to advance farther, and from the *mechanical* to pass to the *teleological* combination, we must invoke new considerations.

Among the phenomena of nature which come under experience, there are those which only urge the mind to the investigation of their efficient causes—that is to say, which invite us to trace backwards the series of the phenomena until one meets the decisive circumstance called cause, whence the whole series proceeds (except we ascend from this circumstance itself to other anterior circumstances). As to the last phenomenon, it seems itself to be the termination of a series, and the mind feels no need to seek the consequence of it. A stone falls, for example; a volcano makes an eruption; thunder bursts, and ravages. When once the phenomenon has taken place, with its immediate consequences, it seems that all is finished; we ask ourselves how it has been produced. But the cause found, the mind declares itself satisfied, and the phenomenon which has just passed before us, though it were complicated like the eruption of a volcano, a storm, a deluge, has not any precise and determinate bond with the future; it seems to be in itself entirely finished, and only to have relation with the past of which it is the effect.

Without doubt there is here, I acknowledge, a certain illusion, for no phenomenon of the universe is without some relation to the future as well as to the past; and Leibnitz has rightly said that the future can be read in the past, and that the present is big with the future. In this sense it is certain that no phenomenon is absoluely finished. The waves which happen to beat upon a steep shore produce a fall of rocks, which, broken at length by the effect of these same waves, become, little by little, sand fit for certain forms of vegetation, and so on *ad infinitum*. Each phenomenon, whatever it be, is therefore not only the end of one series, it is also the beginning of another. We allow all that; but it remains true, that what characterises the phenomena of which we are speaking is, that in order to comprehend and give an account

of them, we have no need to view them in relation to their future consequences. The wave is explained by the movement of the ocean, which is explained by the combined attraction of the moon and of the sun; the fall of rocks is explained by the beating of the wave against the cliff, and so on; each phenomenon is sufficiently and clearly explained by that preceding, without any necessary relation to that which follows. If, at the moment when the wind causes the fall of a stone, a fiat of divine power were to annihilate the universe, the last phenomenon produced, although interrupted in its consequences, would not be the less complete and explained in itself, and nothing would be wanting to make it entirely what it must be, namely, the fall of a stone.

But it is not the same in all cases, and here we touch the knot of the question.

To make our meaning well understood, let us take an example in a case where the finality is incontestable, namely, in the works of human industry: we shall see later how far one is warranted to employ this kind of examples.[1] Let us consider, say, a machine. I say that what distinguishes this kind of object is that it is doubly conditioned,—on the side of the past, on the one hand, by its relation to efficient causes, and on the side of the future, on the other hand, by its relation to final causes. For example, a locomotive is conditioned on the one side by physical laws,—by the solidity of iron, by its malleability, by the elasticity of steam, etc., in a word, by all the physical properties which have rendered possible the construction of this machine and its action; for nothing can be produced except conformably to the properties of matter. In the second place, this machine is conditioned by the end to which it is destined, for according as it has to raise stones, to put in motion a railway train, to weave, to full, to dig, etc., it takes forms endlessly varied. Thus, although these forms can only be produced in the field rendered possible by the properties and the general laws of nature, these properties and

[1] See chap. iii.

laws would of themselves be insufficient to circumscribe matter into this or that form, and for this or that precise effect. That general and indeterminate causes, like the malleability of iron, gravity, elasticity, etc., should be able, among the endless variety of combinations of which matter is susceptible, to find one precisely corresponding to a determinate effect, is what is contrary to every law of causality; and when such a coincidence meets us, we explain it by supposing that this effect already pre-existed in the cause in a certain manner, and that it has directed and circumscribed its action. Whence it comes that, in presence of a machine, a tool, or any fragment of human industry, we say: This is not a freak of nature, it is the work of man.

'If one were to find on a desert island,' says Fénélon, 'a beautiful marble statue, he would doubtless at once say: There have formerly been men here; I recognise the hand of a talented sculptor.' These words have had in recent times a curious justification. What has been found, not in a desert island, but in antediluvian deposits, is not marble statues, nor magnificent palaces, but tools, and the rudest possible; hatchets, as at least is supposed, stones cut in an awkward manner, such as can sometimes be met with when rocks are broken. And yet, however rude this work may be, the fact that such stones have been met with in great number has sufficed to lead to the conclusion that they cannot be a freak of nature. That mass of objects collected in the same place, cut in the same manner, indicates a relation of finality; they are no longer stones, they are *instruments*—that is to say, objects *destined* to cut, to pierce, to strike, to produce this or that effect. This induction does not raise the shadow of a doubt; and yet, if a coincidence of unknown causes has been able to produce the wing of the bird so marvellously adapted for flying, why should not another coincidence of unknown causes have been able to produce this heap of rude stones, so imperfectly adapted to their object? On what, then, in this case, is the universally admitted induction founded?

On this: that the objects which present themselves to us have not only relation to the past, but also to the future, and appear to us conditioned not only by their causes, but also by their effects. Here, for instance, the hatchets found by M. Boucher de Perthes do not appear to us only as fragments of rock, but they present certain forms, dimensions, and combinations of hollows and projections which can only be explained by a certain relation to the action of cutting. That action of cutting, which results from the structure of the hatchet, and which in this sense is an effect, has been at the same time one of the determining causes of the form which has been given to the stone; it is therefore a sort of cause, but a cause which acts in some fashion before existing; it is an effect which, foreseen or predetermined by the efficient cause, has obliged it to take one direction rather than another; it is an end; it is a final cause.

We have seen, by the first principle laid down above, that wherever there is a combination or harmony of phenomena, there must be a precise cause to explain this combination or harmony. But now we require something more. When this combination (already remarkable in itself as a complex and precise coincidence of heterogeneous phenomena) has, besides, the character of being determined relatively to a future phenomenon more or less remote, the principle of causality demands that we explain not only the complexity of the combination, but also that relation to a future effect which, among an infinitude of possible combinations, seems to have circumscribed the action of the efficient cause, and to have determined it to that given form. This correlation to the future cannot be comprehended excepting that future phenomenon already pre-exists in a certain fashion in the efficient cause, and directs its action. It is in this sense that a cause is said to tend to an end.

Thus, when a combination of phenomena, in order to be comprehended, only requires to be referred to its antecedent conditions, there is in this case nothing else than the relation

of cause and effect; but when the combination, in order to become intelligible, must be referred not only to its anterior causes, but to its future effects, the simple relation of cause to effect no longer suffices, and is transformed into a relation of *means to end.*

Let us consider now the following example, say a stomach fit to digest flesh. Let us first suppose, for the sake of argument, that this is a simple consequence, and not an end. Here, now, is the problem which the physiologist sets himself, and which nature before him must have set herself. How does not the stomach, which digests meat, digest itself? How does not the gastric juice, which attacks and dissolves all sorts of food, dissolve the stomach, which is precisely of the same nature as the other foods? Well, now, it appears that nature, answering the objection beforehand, has endued the internal walls of the organ with a special varnish, which renders them unassailable by the action of the gastric juice.[1] How can one refuse to admit that the production of this varnish has a determinate and rigorously calculated relation to the future phenomenon which the stomach behoved to produce? To say that such a relation does not exist, and is the result of a pure coincidence, is to admit that while certain physical causes produced the substance called stomach, other causes, without any accord with the preceding, produced the substance called *epithelium*, which is found to be precisely the condition *sine quâ non* of the digestive function. These two series of causes, working in the dark, without any relation between them or with the future, yet end by harmonizing, and by their accord render possible the future phenomenon, which would not be so without it. Is it not renouncing the principle of causality merely to see in this a fortuitous coincidence, and the result

[1] 'If the gastric juice does not digest the walls of the living stomach, it is because during life the pepsine cannot be absorbed. The presence of epithelium on the mucous members in general, on the stomachic mucous membrane especially, opposes a complete obstacle to absorption. . . . The epithelium, a species of glutinous mucous, which lines the inner wall of this organ, . . . this encloses the gastric juice as in a vase, impermeable as if it were of procelain.' —Cl. Bernard, *Leçons de physiologie*, t. ii. p. 408.

of certain happy chances? Is it not as if one said that two persons, of whom the one speaks Russ and the other English, and who are ignorant of each other's language, can yet talk together, in virtue of fortunate circumstances which caused that the discourse of the one was found to be exactly the reply to the question of the other?

Let us take another example. All the animals called mammalia are at the same time viviparous. Let us study this remarkable coincidence. Here are a certain number of causes, themselves already very complicated, which together concur to the function called parturition, whence there results the production of a young one. This young one is as yet incapable of itself seeking its food; and of all nourishment fit for its age, the best, if not the only one, is milk. Now it is found that another series of causes has produced in the mother other organs called breasts, adapted to a secretive function, the product of which is precisely that which best, if not exclusively, suits the young. It is found, besides, that these organs remain inactive during all one portion of life; that they only perform their functions at certain intervals and at certain periods, and that these periods are precisely those of parturition. If it be admitted that lactation is not at all determined by the future phenomenon of the food of the young one, one must in this case also suppose that two series of causes, acting separately without knowing each other, without communication, have coincided by happy and fortuitous circumstances in this strange final result, which implies a strict suitableness and an extraordinary adaptation. We say, according to our principle, that it is to be false to the laws of causality to leave unexplained this strange accord of the past with the future.

The learned lawgiver of the inductive logic, J. Stuart Mill, has acknowledged that the preceding reasoning is one of the most striking applications of the rules of induction. When a great number of phenomena, very different in every other point of view, yet present one common and constant circumstance, this circumstance may be given as the cause. This

is what is called the *method of concordance.* Now, in the present case (say, for example, the adaptation of the eye to the light), there are an infinite number of phenomena which have all coincided in this single circumstance, namely, to promote vision. Vision is thus the circumstance common to all, in which alone they coincide. It is, therefore, the cause of their coincidence; but as, on the other hand, it is their effect, and cannot act before existing, it is not vision itself, but the idea of vision that is here the true cause, which is expressed by saying that the eye is made for seeing.[1]

After what has been said, it is evident how just is the ingenious approximation which has been made between the method of final causes and the analysis of geometricians.[2] It appears, in short, that nature, when she proceeds by efficient causes, acts like the geometrician who follows the synthetic method; who sets out, that is to say, from a principle, and who deduces consequences from it, whatever they may be. On the other hand, when she proceeds by final causes, she resembles a geometrician who sets himself a problem, and who, by the analysis of the data of the question, finds the very elements of the solution. To employ the distinction of a philosophical geometrician, the one process is a *deduction,* the other a *reduction.* The one consists in deriving a truth from a given truth; the other, more fertile, consists in seeking from what truth one could start in order to solve any given problem. It consists, therefore, in 'reducing the knowledge of a thing to that of others of which it must be the consequence.'[3] The analogy of the two processes is strikingly evident: here it is a consequence which serves to discover the principle, which, consequently, is in some sort the principle of

[1] This remarkable analysis of the argument of final causes is given by Mill in his posthumous work, for the rest so bold, entitled *Essays on Religion,* pp. 170–172. I ought to add, in order to be quite exact, that, according to Mill, the argument had lost much force since the rise of the theory of Darwin. But none the less he concludes that the hypothesis of a plan is still by far the most probable.

[2] Trendelenburg, *Logische untersuchungen,* chap. ix.

[3] Duhamel, *De la méthode dans les sciences et raisonnements,* p. 24.

its principle; there, it is an effect which explains the cause, and which is in some sort the cause of its own cause. But let us illustrate these analogies more in detail.

According to the geometrician quoted, the application of the analytic method, or of reduction, is not only of use in science, but in practical life. Every question resolved, in the one case as in the other, can only be so by this procedure: 'Whatever one proposes to oneself,' says he, 'one necessarily asks oneself what is that which must be done beforehand, and which will conduce to the end proposed. If this new thing cannot be done immediately, one inquires on what other it depends, and so on till one has found that with which one must commence. Knowing now the point of departure, one has only further to do successively all those things in the inverse order to that in which they have been discovered. In this manner one first makes analysis, and then synthesis.'[1] The latter, therefore, is the reciprocal of analysis; it is so in the same manner that the series of efficient causes is the reciprocal of the series of final causes. Nature executes *synthetically* what the author of nature has invented *analytically*.[2] The same geometrician adopts himself the very analogy we employ, and which is so striking, when he says: 'The method will always consist in setting out, whether from the result or from the thing which one requires—in a word, *from the end we set before us*, and in substituting for it a more easy one, and which will lead to the latter by known *means*.'[3]

Let us meanwhile compare with this method that which nature follows in producing organs. Here is, for instance, how a naturalist expounds the theory of the flight of birds. He attributes to the author of nature an analytic reasoning, per-

[1] Duhamel, *De la méthode dans les sciences et raisonnements*, p. 56.

[2] It is important to point out that we employ these two words in the sense of geometricians, and in particular, of the Greek geometricians; for in another sense it would be more correct to say that it is the order of efficient causes which is analytic, and that of final causes which is synthetic.

[3] Duhamel, *De la méthode dans les sciences et raisonnements*, p. 56.

fectly similar to that which has just been described. 'If one admitted,' says Strauss Durckeim, 'that a man of superior genius had the power to create at will, by mere thought, whatever can be conceived, and that he wished to transform the type of mammalia into that of a flying animal, a perfect aerial sailor, capable of long sustaining a rapid flight, he would be led, *from consequence to consequence*, to form a bird such as we know them, even if these animals had not been known to him, so entirely, even to the most minute details, is everything strictly combined and calculated in the structure of their body for the faculty of flight.'[1] In order to solve this problem, 'it is not enough to convert the anterior members in any fashion into a large blade, whose alternate movements upwards and downwards behove to effect the translation of the body in the air from behind forwards, but these wings must also be placed according to certain mechanical principles, to render this movement possible; besides, this new function must in no respect disturb the others, and when it requires any change in the form and arrangement of any other organ, the latter must equally be modified in consequence of this function of flying. Above all, the new being or bird must be able to hold itself in position, and to walk on its hind limbs, and to make, besides, all other movements in more or less eminent degrees, according to the purpose which each organ is to serve. Now it is in these numerous modifications depending on each other, and all on the principal function or on flying, that one finds, as in every other case, the application of the most transcendent science and the most sublime wisdom.' We clearly see from these words that the given problem is one of analysis—namely, how to transform a mammifer into a bird, given the laws of mechanics and the physical and physio-

[1] *Théologie de la nature*, t. i. p. 257. This remarkable work is one of those in which the argument of final causes has been developed with the utmost science and precision. The author, besides, was a distinguished scientist; he is known specially by a theory of the flight of insects, which M. Marey has since perfected. The latter has justly described his work by calling it 'a chaos of ingenious, profound, and puerile ideas.' (See *Revue des cours scientifiques*, 1er série, t. vi.)

logical conditions of life. It is also evident that the solution of this problem requires that the supposed author of this production has ascended step by step, the series of conditions which that solution required, until he arrived at the point from which it was necessary to start, whether from the mammiferous type by way of transformation, or from the vertebrate type by way of differentiation. The author develops, in the greatest detail and in an entirely technical manner, which we cannot here analyze, these learned mechanics. Among the precautions and measures taken by nature for the solution of the problem, let us rest content with mentioning some of those most easily understood without special knowledge; for example, the invention of feathers, and that of the varnish which covers them. The first of these two inventions meets this difficulty: how to cover the body of the bird without too much increasing its weight, and without rendering its flight too difficult. The second meets this other difficulty: how to prevent the feathers from becoming too heavy from rain.

As regards the first problem, nature, employing here again the analysis of the geometrician, has reasoned according to our naturalist in the following manner: 'Light hair would not have sufficed to preserve to those animals a nearly equal temperature, and thick wool, like that of sheep, would have rendered flight impossible.' How solve this delicate problem? In this manner: 'By modifying the clothing of these animals, that is to say, by transforming hair into feathers, and by giving to these organs the great dimensions which they have in the great feathers,' so as 'to increase the surface of the wings without sensibly increasing the weight of the body.'[1] As regards the solution of the second problem, this is the series of ideas which must have been gone through: 'If the feathers were liable to be easily moistened, the rain would make them stick together, which would considerably impede flight, and even render it impossible, as is seen in the case of animals forcibly wetted. But divine benevolence has guarded

[1] *Théologie de la nature*, t. i. p. 302.

against this inconvenience by giving to those animals a special organ secreting an oily substance, with which the bird covers its feathers in order to overlay them with a dry varnish, which renders them so entirely impermeable to water that these animals are never wetted with it.'[1]

This comparison of the analytic method with the procedure of final causes may serve to explain one of the terms of which Aristotle sometimes made use to express the end, namely, *τὸ ἐξ ὑποθέσεως ἀναγκαῖον, the hypothetically necessary.* In effect, the end is what I wish to attain; it is only, therefore, something necessary for me by hypothesis. For example, the end of gaining money is only a hypothetical necessity, for I can always will not to gain it. It is not the same with this other necessity, for instance, that I must die; that is absolutely necessary. The result is therefore an absolute necessity, the end is only relatively necessary. Thus, to solve a problem is only necessary by hypothesis. It is I who choose it, while I do not choose the consequences of a principle: they are imposed upon me with an absolute necessity.

From all the foregoing, it follows that the sought for criterion of the final cause is the agreement of the present with the future, the determination of the one by the other. Still, notwithstanding all the reasons given, might it not yet be asked if this criterion would not assume exactly what is in question? For this agreement to which we appeal is only surprising if we imagine beforehand the future phenomenon as fixed *à priori*, and as a goal which nature *ought* to reach, as a *problem* which it has taken in hand to solve. In this case it is true that nature, blind and without an end, cannot accidentally hit upon the best possible combination in relation to such an end. For instance, if a target is set before a blind man, and a point in that target, it is extremely improbable that, shooting at random, without even knowing that there is an end, he should attain it. But this is sup-

[1] *Théologie de la nature*, p. 324. See likewise, in the sequel of the preceding passage, the analysis of the problem of the colouring of feathers.

posing beforehand there is an end. Let us suppose, on the other hand, that without proposing to himself any end, and shooting at random, he yet hits some place, there is nothing astonishing in that. The same is the case with nature. If, by a gratuitous hypothesis, we begin by supposing that there ought to be flying, walking, self-nourishing animals, it is very surprising that in effect nature has precisely realized these prodigies. But it will be said: this is precisely what is in question. If it is admitted that nature had not in reality any problem to solve, any end to attain, that she obeyed her own laws, and that from those laws have resulted an infinite number of diverse phenomena, which are only the results of these properties; what, then, is there surprising in that there should be agreement and harmony between the causes and the effects? To wonder at this agreement is to conceive beforehand the effect as a fixed point which nature behoved to have in view—that is to say, to conceive it as an end, which is therefore an evident circle.

We maintain, on the other hand, that what occurs first as an *effect*, takes thereupon the character of an *end*, by reason of the number and the complexity of the combinations which have rendered it possible. We do not set out from the idea of an end, to conclude from it that the combinations which conduct to it are means, but, on the contrary, those combinations only appear intelligible to us when viewed as means; and this is why the effect becomes an end. We set out, in short, from a *fixed point*, which is given us in experience as an effect; but this effect only being possible by an incalculable mass of *coincidences*, it is this agreement between so many coincidences and a certain effect which constitutes precisely the proof of finality.[1]

[1] Hartmann (*Philosophie des Unbewussten*, Introd. chap. ii.) has attempted to submit to calculation the probability that an organic product is the result of an intelligent, and not of a physical cause. For instance, for the production of the eye, this probability would be according to him 0·99999, that is to say, almost equivalent to unity or certainty. But those mathematical calculations are pure fictions, which perniciously give a false appearance of strictness to that which cannot have it, and translate pure and simple into abstract signs a conviction which we have already in the mind.

In order to render evident the force of this doctrine, let us choose a very complex combination—for instance, the human eye, with its final result, sight. Let us consider one of the factors which enter into this combination, the retina or nervous material, sensitive to the light, and susceptible of receiving an image like a photographic plate. Let us suppose that this relation of the retina to the light is a simple relation of cause to effect. This effect is, therefore, given to us by experience as resulting from such an organic property. This is what I call our fixed point, which will not be an end fixed beforehand and arbitrarily by ourselves, but a positive and experimental datum. But now, in order that this result, contained potentially in the properties of the retina, may be realized, a thousand million combinations are needed, each more surprising than the others, and one might bet an infinity against one that these combinations will never occur; for, in order that the retina may be able to manifest this property, unknown causes must have constructed a machine to concentrate the luminous rays on the sensible point, where they are susceptible of being painted and of producing an impression. An infinite number of causes, working blindly and without mutual understanding, must therefore have happened, to light upon the favourable combination which permits the retina to receive an image. Now we maintain that such a coincidence will be fortuitous, that is to say, without cause, if it is not granted that it has taken place precisely *in order* that this manifestation might take place; thus, what was till then merely an effect will for us become an end. It is evident we do not start at all from the hypothesis that sight is an end, for that is what we wish to demonstrate; no more do we set out from the adaptation of the means to the end, for if there is no end there is no adaptation, and there would be here again a vicious circle. We set out from an effect as effect; then remarking that such an effect has only been possible if millions of causes have *agreed* to produce it, we see in this agreement the criterion which transforms the effect into an *end*, and the causes into *means*.

It is to be understood that, in order that the preceding reasoning may be valid, we may choose in the combination which we are studying whatever factor we may please. In place of the retina, let us take the crystalline humour. Let us admit that nature, without any end, has created the crystalline, that is to say, a lens adapted to concentrate the luminous rays, and which, consequently, renders possible the formation of an image. That will be, if you will, a simple relation of cause to effect. But that is yet a property which only exists potentially in the crystalline, and, in order that it may be realized in a manner which may have any meaning, this concentration of rays must take place upon a point sensible to light. This lens must be placed in a *camera obscura;* it must be in communication with the exterior by an appropriate opening. There must be, in a word, the agreement of so many circumstances that this agreement with a final phenomenon will appear without cause, and purely arbitrary, if the phenomenon is not considered as an end.

From these examples it is clear what we mean by the determination of the present by the future. We will choose in each function its essential and characteristic phenomenon (for instance, in nutrition, assimilation; in respiration, the oxygenation of the blood, etc.). We will commence by considering this phenomenon as a simple result of the properties of organized matter; that is what we call the future phenomenon. Meanwhile, in studying the conditions of the production of this phenomenon, we shall find that there must be, in order to produce it, an enormous mass of coincidences, all landing in precisely the same result. This we call the harmony of the phenomena with the future. Now, how would so many diverse causes happen to converge to the selfsame point if there were not some cause which directed them towards that point? Such is the succession of ideas in virtue of which the result becomes an end.

If we could imagine, on the one hand, an entire and complete combination, independently of the final phenomenon

to which it is appropriated, and, on the other, that phenomenon considered as a result of the combination; if between this combination and this result there were an interval, a separation or limit, were it only for an instant, but yet sufficiently marked for these two terms of the relation to be plainly distinguished by the mind,—the agreement of the combination with the final phenomenon would appear so much the more striking, and would the more surprise the imagination. Now, this is what actually takes place. In effect, in the mystery and the night of the act of incubation—in the obscure sanctuary of the maternal womb in the case of viviparous, in the envelope of the egg in the case of oviparous animals—is formed and fabricated by the collaboration of an incredible number of causes, a living machine, absolutely separated from the external world, yet in agreement with it, all whose parts correspond to certain physical conditions of this external world. The external physical world and the internal laboratory of the living being are separated from each other by impenetrable veils, and yet they are united to each other by an incredible pre-established harmony. On the outside there is a physical agent called light; within, there is fabricated an optical machine adapted to the light: outside, there is an agent called sound; inside, an acoustic machine adapted to sound: outside, vegetables and animals; inside, stills and alembics adapted to the assimilation of these substances: outside, a medium, solid, liquid, or gaseous; inside, a thousand means of locomotion, adapted to the air, the earth, or the water. Thus, on the one hand, there are the final phenomena called sight, hearing, nutrition, flying, walking, swimming, etc.; on the other, the eyes, the ears, the stomach, the wings, the fins, the motive members of every sort. We see clearly in these examples the two terms of the relation,—on the one hand, a system; on the other, the final phenomenon in which it ends. Were there only system and combination, as in crystals, still, as we have seen, there must have been a special cause to explain that system and that combination. But there is more

here; there is the agreement of a system with a phenomenon which will only be produced long after and in new conditions, —consequently a correspondence which cannot be fortuitous, and which would necessarily be so if we do not admit that the final and future phenomenon is precisely the bond of the system and the circumstance which, in whatever manner, has predetermined the combination.

Imagine a blind workman, hidden in a cellar, and destitute of all intelligence, who, merely yielding to the simple need of moving his limbs and his hands, should be found to have forged, without knowing it, a key adapted to the most complicated lock which can possibly be imagined. This is what nature does in the fabrication of the living being.

Nowhere is this pre-established harmony, to which we have just drawn attention, displayed in a more astonishing manner than between the eye and the light. 'In the construction of this organ,' says Trendelenburg, 'we must either admit that light has triumphed over matter and has fashioned it, or else it is the matter itself which has become the master of the light. This is at least what should result from the law of efficient causes, but neither the one nor the other of these two hypotheses takes place in reality. No ray of light falls within the secret depths of the maternal womb, where the eye is formed. Still less could inert matter, which is nothing without the energy of light, be capable of comprehending it. Yet the light and the eye are made the one for the other, and in the miracle of the eye resides the latent consciousness of the light. The moving cause, with its necessary development, is here employed for a higher service. The end commands the whole, and watches over the execution of the parts; and it is with the aid of the end that the eye becomes 'the light of the body.'[1]

As the planetary perturbations have chiefly contributed to set in the clearest light the truth of the law of Newton, in the same way the apparent exceptions to the law of finality may

[1] Trendelenburg, *Logische Untersuchungen*, t. ii. chap. ix. p. 4.

serve to render it more striking and manifest. Thus a clever gymnast, in his most perilous feats, makes a feint of falling, to disquiet for a moment and gain more admiration for his skill. I will mention two examples of it.

Müller informs us that in the structure of the organs of motion the laws of mechanics are not well observed. 'The essence of locomotion,' says he, 'notwithstanding the diversity of forms of motion by swimming, creeping, flying, and walking, consists in this, that certain parts of the body describe arcs, the branches of which extend, after being propped on a fixed point. . . . The laws of the lever play a great part in this.' Now we find, in observing the structure of animals, that these laws have not been applied by nature in the most favourable and economical manner—that is to say, so as to obtain the most motion with the least possible labour. 'In effect,' says Müller, 'however diversely the levers are placed on the animals provided with paws, *they are so almost always in a disadvantageous manner*, for the muscles generally exert upon them a very oblique action; besides that, the insertion is frequently too near the fulcrum.' Here we have, then, apparently an error of nature.

But Müller immediately gives the explanation of it, which, in the end, is found quite agreeable to the principle: 'Considerations of a greater order,' says he, 'have ordained this arrangement, of which the beauty of the forms is not the only end. If nature had placed the levers of all the members in the most favourable manner, the result would have been that the body would have had a complex, angular, troublesome form, and that, despite the precautions apparently taken to utilize force, the expense in this regard would have been more considerable in the final analysis, because of the multiplied obstacles to the harmonious concurrence of actions.' Thus, in this case, the apparent violation of the rule is in reality only its confirmation.

It is the same in another case not less remarkable. Every one knows how much value for their argument the friends of

final causes have attached to the marvellous structure of the eye; it is the classical argument in this matter, and we ourselves have just been indicating it. Yet it is found that the structure of this organ is very far from having all the perfection which was supposed, and Herr Helmholtz has shown that it is filled with imperfections and defects. From this occasion a critic expresses himself as follows: 'The friends of final causes,' says M. Laugel, 'who are in ecstasies over the adaptation of organs to functions, will perhaps have some difficulty in reconciling their theoretical views with the facts which have just been set forth. There is no maker of optical instruments who might not succeed in rendering his apparatus much more perfect than this eye of which we are so proud. . . . The eye has, on the other hand, this remarkable character, that it combines all the known defects of these instruments. . . . There is nothing perfect, nothing finished, in nature. . . . Our organs are instruments at once admirable and rude.'[1]

However, it is found that here again the exception is only a just application of the rule, as is very well explained by this very savant, from whom this difficulty is borrowed. In fact, what Herr Helmholtz has demonstrated is simply that the human eye is not an instrument of precision, and also that it ought not to be so. Doubtless the eye may have numerous defects compared with our optical instruments, defects which our industry is able to avoid; but these defects do not at all impair its veritable use, for its function is not to make delicate experiments, like those which we make with our instruments, but simply to serve us in practical life. Moreover, the scientist in question expresses himself thus: 'The appropriateness of the eye to its end exists in the most perfect manner, and is revealed even in the limit given to its defects. *A reasonable man will not take a razor to cleave blocks;* in like manner, every useless refinement in the optical use of the eye would have rendered that organ more delicate and slower in its applica-

[1] *L'optique et les arts*, p. 27.

tion.'[1] It is evident one must not be in a hurry in the desire to catch nature in a fault, for one is caught in the trap oneself.

The mode of reasoning which we have developed at present, and which we consider as the proof of final causes, is applicable in a much more striking manner still, when we pass from the *adaptation* of organs to their *correlation*. What, in short, did we say? That we must take in each function a fixed point, which is the essential act of the function, and consider this act simply as a result. It is soon evident that, in order to render this result possible, so great a number of coincidences have been required, that these coincidences cannot be explained if that result is not an end. How much more evident still is this argument when one compares, not the different factors of one organ or of one function, but the concordance of different organs or of different functions! Indeed, it then suffices to take one of those organs with its function, and to consider that function as a simple result—for instance, the lungs and respiration. We shall then ask ourselves how this function is possible, and we shall see that it necessarily supposes another organ and another function—for instance, the heart and the circulation. Now, that these two organs and these two functions (hypothetically necessary to each other) should have met together, is what is impossible without a miracle, except a common cause, capable of grasping the relation of the two things, has bound them to each other—that is to say, has made them for each other.

Every one knows that celebrated law, called the *law of organic correlations*, which Cuvier summed up in these terms: 'Every organized being forms a whole, a close system, whose parts mutually correspond and concur in one and the same definitive action by a reciprocal reaction.' It is the same idea that Kant expressed, for his part, by that beautiful definition: 'The organized being,' said he, 'is the being in which all is reciprocally end and means.'[2]

[1] Helmholtz, *Revue des cours publics scientifiques*, 1re série, t. vi. p. 219.

[2] Mr. Huxley, *Revue scientifique* (2e série, t. xii. p. 769), draws an objection to

We have no need to enter here into the details of this law, which has served as the basis of comparative anatomy. Let us be satisfied with indicating some of the most general facts mentioned by Cuvier, in that passage so well known and so often quoted, but which is too apposite to our subject not to be quoted here yet once more: 'A tooth,' says he, 'that is sharp and adapted to tear flesh, will never co-exist in the same species with a foot enveloped in horn, which can only bear the animal, and with which it cannot seize its prey. Whence the rule, that every hoofed animal is herbivorous, and the still more detailed rules, which are only corollaries of the first, that hoofs on the feet indicate molar teeth with flat crowns, a very long alimentary canal, a large or multiplied stomach, and a great number of relations of the same kind.'[1] . . . 'Thus the intestines are in relation to the jaws, the jaws to the claws, the claws to the teeth, the organs of motion, and the organ of intelligence.'[2] Cuvier affirms, again, that the same law even regulates each particular system of organs. Thus, in the alimentary system, 'the form of the teeth, the length, the folds, and the dilatation of the alimentary canal, the number and abundance of the dissolving juices which are poured into

the definition of Kant from the cellular theory of Schwann. 'Kant,' says he, 'defines the mode of existence of living beings by this, that all their parts co-exist on account of the whole, and that the whole itself exists on account of the parts. But since Turpin and Schwann have decomposed the living body into an aggregation of almost independent cells, having each their special laws of development and of growth, the view of Kant has ceased to be tenable. Each cell lives for itself as well as for the whole organism; the cells which float in the blood live at their own expense, and are organisms as independent as the *torulæ* which float in the wort of beer.' We do not see in what respect the cellular theory contradicts the definition of Kant. The cell can have an independent life, and have equally a collective and correlative life. The cell lives for itself. Be it so; but it is added, 'that it lives also for the entire organism,' and reciprocally it lives *by* the organism at the same time as *for* it. There is no contradiction in this, that an independent being should be at the same time a member of that system: it lives at once *by* and *for* it; it is, therefore, as Kant said, both *means* and *end*. Add, finally, that in the cell itself, considered as nucleus of life, all the parts are correlatives to the whole, and the whole to the parts.

[1] Cuvier, *Leçons d'anatomie comparée*, t. i. 1re leçon, art. iv.

[2] Cuvier, *Discours sur les révolutions du globe*.

it, are always in an admirable relation between themselves, and with the nature, hardness, and solubility of the substances which the animal eats.' [1] . . . The general relations engender others which are more particular. 'In order that the jaw may seize,' says he, 'it needs a certain projecting form, a certain relation between the position of the resistance and that of the power to the fulcrum, a certain size of the crotaphite muscle, which requires a certain extent in the hole that receives it, and a certain convexity of the zygomatic arcade under which it passes,' etc.[2]

. . . 'In order that the claws may be able to seize, a certain mobility in the toes will be necessary, a certain strength in the nails, whence there will result determinate forms in all the phalanges, and necessary distributions of muscles and of tendons. It will be necessary that the fore-arm have a certain ease in turning, from whence, again, will result determinate forms in the bones which compose it. But the bones of the fore-arm, being articulated on the humerus, cannot change their forms without involving changes in the latter. . . . The play of all these parts will require certain proportions in all their muscles, and the impressions of these muscles, thus proportioned, will again determine more particularly the form of the bones.' [3]

The same is the case with functions as with organs; they are indissolubly bound to each other, and responsible for each other. 'Respiration,' says Flourens,[4] 'when it takes place in a circumscribed respiratory organ, cannot dispense with the circulation, for the blood must arrive in the respiratory organ, or the organ which receives the air, and it is the circulation which conducts it thither: the circulation cannot dispense with irritability, for it is irritability which determines the contractions of the heart, and consequently the movements of the blood; muscular irritability cannot, in its turn, dispense with nervous action. And if one of these things change, all

[1] *Leçons d'anatomie comparée*, leçon 1re.
[2] *Révolutions du globe.* [3] *Ibid.*
[4] Flourens, *Travaux de Cuvier*, p. 87.

the others must change. If the circulation fail, the respiration can no longer be circumscribed; it must become general, as in insects. The blood no longer coming to seek the air, the air must go in search of the blood. There are, therefore, organic conditions which require each other; there are those which are incompatible. A circumscribed respiration requires of necessity a pulmonary circulation; a general respiration renders a pulmonary circulation useless, and excludes it. The strength of motions is in a constant dependence on the extent of respiration, for it is respiration which restores to muscular fibre its exhausted irritability. There are four kinds of movements, which correspond to the four degrees of respiration: the flight of the bird, which corresponds to the double respiration; the walking, leaping, or running of mammalia, which correspond to complete but simple respiration; the crawling of the reptile, a motion by which the animal only drags itself upon the ground; and the swimming of the fish, a motion for which the animal requires to be sustained in a liquid whose specific gravity is almost equal to its own.'

In order to explain without a final cause these innumerable correlations, we must suppose that while physical causes are at work on the one hand to produce certain organs, other causes are found to produce at the same time other organs in necessary correlation with the first. How have two systems of laws, acting thus separately and blindly, been able to coincide in a manner so astonishing in their common action? I understand, strictly, that physical nature, left to itself, may come to create cutting teeth; but I cannot comprehend why the same nature produces at the same time claws and not hoofs. Neighbouring organs can doubtless modify themselves reciprocally, and adapt themselves to each other; but how shall the action of the heart put itself in harmony with that of the lungs? How shall the organs of respiration put themselves in harmony with the organs of motion? If, in place of admitting distinct causes which converge towards each other, we admit only one, we must recognise that the things occur

exactly *as if* that cause had determined to act by a sort of anticipating idea of the effect; and till there be proof to the contrary, the presumption is in favour of this hypothesis. The organic correlations remarkably verify the principle to which Kant reduces finality—namely, the predetermination of the parts by the idea of the whole. This foreordination of the parts to the whole—this anticipated government of parts by the whole, and the agreement of that whole itself with that general phenomenon which is called life—seems, indeed, to indicate that the whole is not a simple effect, but also a cause, and that the parts would not have affected that arrangement if the whole had not beforehand commanded it.

This predisposition and foreordination of the present by the future is again particularly visible in the formation of the organized being.

All the germs of animals, without exception, at the first moment when the eye of the observer can seize them, present an appearance absolutely similar. At this first stage the germ does not permit the future being which it contains in any manner to appear. More than this, the first transformations of the germ appear alike identical in all animals without exception, until the moment when the exterior layers of the germ commence to take the form of an organized tissue or blastoderm. The germ then becomes an embryo, and begins to be divided between the different essential forms of the animal kingdom, the form of the vertebrates and the form of the invertebrates. This development continues, always proceeding from the general to the particular, from the indeterminate to the determinate, from the chief division to the class, from the class to the tribe, from the tribe to the genus, from the genus to the species. In a word, its development is a progressive *differentiation*. But it is not indifferently that such a germ takes such a form: it is not free, quite indeterminate though it be, either to be vertebrate or invertebrate; if vertebrate, to be mammifer, bird, reptile, or fish; if mammifer, to belong to this or that species. No; it can only take the

determinate form of the being from which it proceeds, and it is necessarily like its parents, save the remarkable cases of alternate generation, which themselves revert to the rule, since the same forms recur periodically, though alternately. Formerly, on the theory of the junction of germs, the growth of the germ was explained in an entirely physical manner,—the embryo was nothing else than the animal in miniature; its development was only enlargement. But according to the theory now universally accepted, the animal is formed piece by piece, and successively creates all its organs by assimilating little by little the exterior parts, and arranging them according to the type to which it belongs, in proceeding, as we have said, from the general to the particular. How can we imagine this labour without a kind of previous conception of all that these successive additions behoved to form, and which is the reason of each of these accretions?[1] Thus the embryo completes itself little by little, as if it had a model before it. We have here, indeed, the λόγος σπερματικὸς of the Stoics—that secret and active reason placed in the seeds of things, and which, conscious or unconscious, is the spring of life in the universe.

In fine, of all the facts of co-ordination, there is none more remarkable, complex, and troublesome, for the exclusive partisans of physical causes, than the existence of the sexes —that is to say, of the means employed by nature for the perpetuation of species. Here there are several things to remark.

In fact, the question is no longer merely as hitherto concerning the appropriateness of an organ to a function, but, what is still more striking, of an organ to another organ. In the first case, the function being nothing but the aggregate of the acts executed by the organ, one might say in utmost strict-

[1] 'When the question is about an organic evolution *which is in the future*,' says Cl. Bernard, 'we no longer comprehend this property of matter at long range. The egg is to *become* something; but how conceive that matter should have as a property to include operations of mechanism which do not yet exist?' (*Rapport sur la physiologie générale*, p. 110.)

ness that it is not astonishing that the organ is fitted to produce the acts it performs, for otherwise it would not perform them; that it is not astonishing that a cause which produces certain effects is fitted to produce those effects. But in the case now before us such a difficulty cannot even be raised, for it is not the appropriateness of a cause to its effect that we here admire, it is the appropriateness of an organ to another organ; it is an entirely mechanical adaptation of two apparatus, distinct, yet so bound together that the form of the one is determined by the form of the other; a reciprocal determination which evidently supposes a relation in the future in inverse direction to the ordinary relation of cause and effect. These two organic apparatus, sometimes united, but most frequently separated into two distinct individuals, are both and reciprocally in a relation of means to ends; for we could not explain to ourselves the extraordinary coincidence of their reciprocal adaptation, if we did not suppose that the very possibility of this adaptation has been the determining reason which has made them take this double form. Here it can no longer be said that we are taking a simple effect for an end, a result for an intention. The organs of the sexes are not the effects of each other; the male organ is not the cause of the female organ, nor reciprocally. Those two organs are two distinct and independent effects, and yet they can only be explained the one by the other, which is precisely the relation of finality. The shift which explains the relation of agent to function by a simple relation of cause to effect is therefore not available here, for there is manifest appropriateness without causality.

Let us consider, besides, that the appropriateness in question is not merely a correlation of organs, a harmonious concurrence of functions, as in the law of Cuvier. It is something still more palpable; it is a mechanical and material adaptation, a relation of form to form, of structure to structure. Without doubt, in the organism all the parts, as we have seen, are in relation to the others—the heart concurs with the lungs, the

brain with the members, in a common action. But this is only a co-operation, a work in common; and although the end is already clearly and evidently manifest in that case, it is always merely a quite intelligible unity of action. In the case of which we are speaking, the co-operation is of a much more palpable nature, for it supposes the application of one organ to another, and a momentary junction which blends them into one, a phenomenon which could not take place without a perfect coincidence of form and structure.[1] For this reason Plato could say, in a celebrated fable, that the two sexes are the two halves of one whole—halves which seek to be joined in order to reconstruct the primitive whole. This marvellous reciprocal adaptation cannot be considered as a simple result of habit and meeting, as if it were said, for instance, that the just form of the articulations of the bones simply arises from the play of the organs upon each other; for here the habit and meeting, so far from explaining it, suppose precisely the formation of the organs. In order that there may be a meeting, there must already have been adaptation and reciprocity of convenience; and it cannot be said that this adaptation has been made in course of time, for as the species could not subsist without it, it would have perished before it had been formed.

In fine, if there were only between the organs of sex a simple conformity of structure and a material adaptation, but without useful effect, one could still admire this coincidence without being absolutely forced to see in it a relation of finality. For instance, the hand of a man is very fit to be applied to the hand of another man; it would, however, hardly seem probable to say that nature has given men this organ in order that they might be able to shake hands. This quite external adaptation which results from the structure of the hand does not imply a reciprocal predisposition. But in the sexes, besides the appropriateness of organ to organ, there is further that of organ to function; and it is the meeting of

[1] The difference of the sexes may occur without copulation, but we instance here the most remarkable case.

these two adaptations which causes in this case finality to be imposed on the mind in a manner so imperious and so overpowering. In fine, this unique function, performed by two organs, is precisely that by which the individual secures the perpetuity of the species, and that without knowing and without willing it, at least in the inferior species. Thus in all the degrees of the phenomenon, we see the determination of the present by the future: the structure of the two organs is only explained by the fact of their meeting; their meeting, by the function which results from it; the function, in fine, by its effect, which is the production of a new being, itself called in its turn to perpetuate and to immortalize the species. Here the order of causes is manifestly reversed, and whatever Lucretius and Spinoza may say, it is the effects that are the causes.

To sum up: If it be agreed to apply the term *principle of concordance* to the principle in virtue of which the human mind requires that we explain not only each phenomenon in particular, but also the order and agreement of phenomena, that principle will assume two forms, or will be divided into two distinct principles.

The first will be applicable to the physical and mechanical order, and may be called *the principle of mechanical concordance*;[1] the second will be applicable to the biological order, and may be called *the principle of teleological concordance*, or principle of final causes.

I. *First principle.*—When a certain coincidence of phenomena is remarked constantly, it does not suffice to attach each phenomenon in particular to its antecedent causes; it is necessary also to give a precise reason for the coincidence itself.

[1] Perhaps it will be thought that it is granting too much to give up thus to material causes all the physical and mechanical world, to recognise a principle of order which is not finality. Suffice it to reply, that that is only a provisional view, required by the necessity of method and clearness of exposition (διδασκαλίας χάριν), but upon which there may be opportunity to come back. (See under chap. v., *Mechanism and Finality.*)

In other words—The agreement of phenomena supposes a precise cause, with a probability which is in proportion to the number and the diversity of the concordant phenomena.

II. *Second principle.*—When a certain coincidence of phenomena is determined, not only by its relation to the past, but also by its relation to the future, we will not have done justice to the principle of causality if, in supposing a cause for this coincidence, we neglect to explain, besides, its precise relation to the future phenomenon.

In other words—The agreement of several phenomena, bound together with a future determinate phenomenon, supposes a cause in which that future phenomenon is ideally represented, and the probability of this presumption increases with the complexity of the concordant phenomena and the number of the relations which unite them to the final phenomenon.

CHAPTER II.

THE FACTS.

OUR intention is not to reproduce here the innumerable facts, so usefully enumerated elsewhere in treatises of physical theology,[1] which bear in favour of finality. We shall rest content with mentioning a certain number of them, and those the chief, by way of examples and to fix our ideas.

The operations of living nature, in which we can recognise in a striking manner the character of finality, are of two kinds, *functions* and *instincts*. The former can be defined as the *interior actions* of the organs; the latter as the *exterior actions* of these organs, and in particular of the organs of relation. As regards the functions, we will chiefly instance the agreement of the organic mechanism with the function;

[1] The treatises of physical theology, especially of the 18th century, are innumerable, and would by themselves form quite a library. The principal works of this kind are the following:—Derham, *Physico-theology* (London 1714); *Astro-theology* (1715). John Ray, *Wisdom of God in the Works of Creation* (1714). Swammerdam, *Bibel der Natur* (1738). Reimarus, *La religion naturelle* (1754). Ch. Bonnet, *Contemplation de la nature* (1764). Paley, *Natural Theology* (the last edition is accompanied with notes by Lord Brougham and Ch. Bell); a theology was at last derived from all the objects of nature. The naturalist Lesser is above all remarkable for his works of this kind. We have by him: *Hélio-théologie* (1744); *Litho-théologie* (1757); *Testaceo-théologie* (1744); *Insecto-théologie*, etc. Let us cite further the *Théologie de l'eau*, by Fabricius (1741). In France the works of this kind have been much less numerous. We will mention the *Traité de l'existence de Dieu*, by Fénélon; the *Spectacle de la nature*, by the Abbé Pluche; the *Etudes* and the *Harmonies de la nature*, by Bernardin de Saint-Pierre (a work in which imagination abounds more than severe science and good logic); and finally, of our own time, the *Théologie de la nature*, by Strauss Durckeim (Paris 1852); and the *Harmonies Providentielles* of M. Ch. Lévêque (Paris 1872). As to the philosophical and logical analysis of the principle of final causes in itself, it was rare in the 17th century before Kant. Let us mention only the little work, unhappily unfinished, of Lesage of Geneva, inserted in the *Notice sur la vie et les travaux de Lesage*, by Prévost. (See our appendix, Dissertation III., *Lesage and Final Causes*.)

as regards the instincts, the agreement of the functional mechanism with the effect to be produced. That which is most striking from our point of view, in function, is the structure of the organ, and in instinct, is the operation itself.

I. *Organs and functions.*[1]—Of all the facts of adaptation, the most striking is the structure of the eye in its relation to the act of vision. It is, we may say, the classical argument in this matter. It would be a vain scruple to deprive ourselves of so arresting and marvellous an instance merely because it is so well known, and become common by use. What occurs in its own place is never common. Let us try, then, to set before ourselves the difficulties of the problem, and the innumerable conditions which its solution requires.[2]

The first condition in order that vision may be performed is the existence of a nerve sensible to the light. That is a primordial fact, which it is not possible to explain, and beyond which, till now, analysis is unable to proceed. There must therefore be a nerve endowed with a specific sensibility, which cannot in any way be confounded with tactile sensibility. But a nerve simply sensible to the light would only serve to distinguish day from night; but to discern objects, to see veritably, something more is necessary, namely, an optical apparatus more or less resembling those which human industry can fabricate. Observe what the illustrious German physiologist Müller says on this subject:

'In order that the light may project upon the retina the image of the objects from which it proceeds, that which comes

[1] It is needless to observe that what we here set forth are the facts *favourable* to the doctrine of finality. As to the facts unfavourable or contrary, we will examine them afterwards. (See chap. viii., *Objections and Difficulties.*) Let it suffice to say that the fact of existence, of the development and the duration of life in the universe, sufficiently proves the preponderance of favourable cases over the opposite, for if the latter prevailed in number, it is evident that life could not exist.

[2] See on the same question not only the treatises we have just named, but a work written in an altogether different spirit, the *Philosophy of the Unconscious*, by Hartmann. The author (Introd. chap. ii.) enumerates fourteen distinct conditions necessary to vision, and reduces to an infinitely small fraction (which may be regarded as nothing) the probability that all these conditions would be found together in virtue of a physical law.

from certain definite parts of the external bodies, whether immediately or by reflection, must not put in action more than corresponding parts of the retina, a thing which requires certain physical conditions. The light which emanates from a luminous body diffuses itself by radiating in all directions where it meets no obstacle to its passage; a luminous point will therefore lighten a whole surface, not a single point of that surface. If the surface which receives the light radiating from a point is the united surface of the retina, the light of that point causes the sensation of light in the whole, and not merely in a part of the nervous membrane; and it is the same with all other luminous points which may by radiation illuminate the retina.'

One easily understands that in this case there would not be vision properly so called. The entire retina without optical apparatus would see nothing definite; it would perceive light, but not images. 'Consequently,' to continue our quotation from Müller, 'in order that the external light may produce in the eye an image corresponding to the bodies, it is indispensable that there should be arrangements to cause the light given forth from the points *a b c . . n*, to act only on isolated points of the retina arranged in the same order, and which prevent one point of that membrane from being illuminated at once by several points of the external world.' [1]

It is evident that distinct vision is a problem altogether of the same order as those which the mechanician or geometrician may have to solve. For the solution of problems, geometry employs the analytic method, which supposes the problem solved. In the same way, as we have said above,[2] it seems that nature behoved to employ here an analogous method. Starting from the hypothesis of a being that needs for its guidance to distinguish objects from each other, it behoved to ask itself what conditions such a result previously supposes. Between the *diffuse* vision, which consists simply in distinguish-

[1] Müller, *Manuel de physiologie*. French translation by Jourdan, t. ii. p. 275.
[2] See the preceding chapter, p. 40.

ing day from night, and the *distinct* vision, which perceives images, there is an abyss; and an infinite number of precautions and conditions is necessary, without which it would be impossible to pass from one of these phenomena to the other. If we admit that distinct vision is only a result and not an end, the coincidence of these innumerable precautions and conditions must be purely fortuitous—that is to say, have taken place by chance, or, in other words, without cause. In short, even if a physical cause sufficed to account for the material structure of the organ, the agreement of that structure, fashioned beforehand, with a remote phenomenon which itself is of the highest importance for the preservation of the living being, would be quite an external coincidence, absolutely without a cause. Let us enter into detail.

In order to attain the result which we have just indicated, nature might employ, and has in fact employed, two different systems. It has created two kinds of apparatus, the *isolating* and the *convergent*. The first are those which are seen in the eyes of insects and crustaceans, and which are called *composite* eyes, or eyes with facets; the others are met with partly in certain insects and crustaceans, partly and specially in the vertebrate animals. 'The first of these systems,' to quote Müller again, 'consists in placing before the retina, and perpendicularly to it, an innumerable quantity of transparent cones, which allow to reach the nervous membrane only the light following the direction of their axis, and absorb by means of the pigment with which their walls are lined all that strikes them obliquely.'[1] We see that in this first system nature has proceeded exactly as do the physicist and the chemist in their laboratory, when, in order to study a phenomenon, they find means to produce it and to isolate it at the same time, by taking certain precautions, that the concomitant circumstances may not come in to disturb the effect of it. This combination of *transparent* cones with *absorbing* walls, this care to make the light come in one direction and to absorb it in all others,

[1] Müller's *Manuel*, p. 277.

recall the precautions of the physicist, who excludes the air to make bodies fall with equal rapidity, who dries them in order to have pure electricity, who, in a word, removes obstacles on the one hand by preventive means, while on the other, by active means, he evokes the phenomenon he wishes to study. Add to this the amazing quantity of combinations which such a system supposes (for they reckon 12,000 and even 20,000 cones in a single eye), and that to these cones there must correspond in the cornea as many little geometrical divisions called facets, and that without this agreement nothing would result. To set aside in this case every final cause, we must admit that while certain physical and blind causes produced transparent cones, other physical causes, equally blind, prepared walls fitted to absorb the light; that some made the cones, and others the corresponding facets; that other blind causes brought both into harmony, forced them to coincide in that combination—itself so wondrously in harmony with a final act, agreeing in its turn with the interests of the animal. If so amazing an assemblage of agreements and conveniences can be produced by a simple coincidence, there is no longer a principle of causality.

But the highest degree of skill and perfection in the art of nature is manifested above all in the second system of which we have spoken, namely, in the system of convergent apparatus, or of eyes with lenses, such as we meet with in the superior animals.

In the previous system, 'the procedure which nature employed to isolate on different points of the organ the light emanating from different points, consists in excluding the rays which would prevent the effect from being produced. It obtains the same result with much more precision still, and especially with a greater intensity of light, by causing to meet anew upon one point the divergent rays which emanate from another point.' The bodies which have thus the power to focus the light are transparent and refracting media: the most perfect form is that of a lens. Such is the principle of

lenticular eyes, or those with *crystalline* humour, of which the most complete model is the human eye.

The eye is an organ so well known that it is needless to insist on the details of its structure. Let us merely recall that this preparation is absolutely like the artificial preparation called the *camera obscura.* Given a box closed on all sides, and only affording entrance to the light by a small opening, if we place behind this opening in the interior of the box a converging lens, the luminous rays proceeding from any object, and forced to pass through this lens, will be found to meet at the end of the box on the surface opposite the opening, and will there reproduce the image of the external object, but turned upside down. This apparatus has become popular since the discovery of photography. We know that the eye is an apparatus of this kind: it is a camera, and all the conditions of the phenomena we have just described are found there realized as far as necessary. Let us mention the combined precautions which have rendered vision possible in this remarkable apparatus.[1]

It is necessary, first of all, that the solid membrane which constitutes the globe of the eye, and which is called the *sclerotic*, should become transparent in a point of its surface, to permit the luminous rays to traverse it; and this transparent part, which is called the *cornea*, must be found to correspond exactly with the opening of the orbit of the eye, for if the sclerotic were opaque in the very place where the eye is in connection with the light, and transparent where it is hidden in the ocular orbit, there would be a contradiction. Such is the first precaution that nature has taken. In the second place, there must be behind the transparent opening which permits the light to enter, convergent media, to unite the luminous rays; for if such media did not occur, the retina situated at the back of this apparatus would not receive the

[1] As to the imperfections which have been pointed out in the structure of the eye, we have replied above (p. 45), with the help of the testimony of M. Helmholtz himself, to the objection which has been drawn from the alleged defects of that organ.

images of objects, but simply the diffused light, and it would be in vain that nature had constructed a camera. Simple ocular points, such as one sees in worms or inferior animals, would have sufficed for distinguishing day from night. And thirdly, there must be found at the extremity of this camera, and opposite the entrance, the *retina*, or diffusion of the optic nerve—the nerve sensible to the light, and which can only see on condition of receiving the image of the object. Suppose that the retina were not placed in the very axis of the transparent cornea and of the crystalline humour, suppose that it were in another part of the eye, it would receive nothing and consequently would see nothing, and the images, projecting themselves on an insensible surface, would not be perceived. The transparent media would then be entirely useless, and it would have been better to dispense with them.

Thus an eye or camera not having a transparent part corresponding to the opening of its orbit, convergent media corresponding to that transparent cornea, and a retina corresponding to these convergent media,—an eye in which these diverse elements, opening of the eye, transparent cornea, convergent medium, retina, were not all placed in the same axis, so that the light could pass through them in succession, —such an eye would imply a contradiction.

But notice that this contradiction would only exist from the point of view of final causes, and not of efficient causes. There would only be contradiction if the eye is an eye, that is, an apparatus destined to see; for if it is only a mechanical combination, found by chance to be fitted for vision, there is no contradiction if the conditions of vision are not realized. Physically speaking, one does not see why there should not be an eye in which the retina did not correspond with the crystalline humour, the crystalline humour with the transparent cornea, the transparent cornea with the opening of the orbit, and, in fine, why an eye perfectly formed should not be hidden in a closed orbit. For, that causes which do not propose to themselves

an end should only realize what is quite conformable to that end, is what does not appear probable.[1]

To those who admire the structure of the eye, there has been objected the uselessness of the crystalline humour, since the blind operated on for cataract can do without it.[2] First, that the crystalline is not absolutely necessary one easily comprehends, since there are in the eye three refracting media,—the vitreous humour, the aqueous humour, and the crystalline itself. If one of these three media disappear, the others can still, strictly speaking, exercise their function, and render vision possible. One does not see so well, but still one sees, which is better than absolute blindness. Besides, it is forgotten that after the operation for cataract the crystalline becomes useless under the condition that it is replaced by a double convex lens, which is nothing else than a double artificial crystalline. Reasoning in this manner, one might just as well say that the legs are useless, since, strictly speaking, one can walk with crutches. Indeed, there are cases in which those affected by cataract see without spectacles; the oculists even advise to exercise the eye as much as possible, in order to attain this result. But this result usually occurs in the case of myopia, that is, the case in which the media of the eye are endued with an excessive refracting property. In this case the abolition of the crystalline may simply have the

[1] The objection will here be brought against us of the blind species, of which recently a considerable number has been found (see the *Comptes rendus de l'Ac. des Sciences*, session of 16th Nov. 1874). This touches the question of rudimentary organs, which we will examine farther on (chap. vi.). Let us merely remark at present that a *rudimentary* organ is not a *contradictory* organ. Besides, we do not deny that there may be some exceptions; for instance, in the genus of the Nereides. (See Müller, t. ii. p. 301.) These *perturbations* are explained, according to our own view, by the inevitable conflict of efficient and final causes. (See under chap. vi.)

[2] 'One may on this subject indicate as a striking example of this absurd disposition, the puerile affectation of certain philosophers to boast of the pretended wisdom of nature in the structure of the eye, particularly in that which concerns the function of the crystalline humour, of which they have gone the length of admiring the fundamental uselessness, as if there could be much wisdom in introducing so inopportunely a part which is not necessary to the phenomenon, and which nevertheless becomes, in certain cases, capable of preventing it altogether.' (Comte, *Philosophie positive*, t. iii. p. 442, note.)

effect of restoring the eye to the normal state of refraction; it is a sort of accidental corrective of myopia. Besides, the crystalline can also be supplied to a certain extent in another manner. Every one knows that the pupil is contractile,—that it contracts or dilates according to the intensity of the light, by an effort of the will. Now, the contraction of the pupil results in increasing the degree of refraction of the luminous rays; for in a camera one can dispense with a converging lens behind the opening which receives the pencil of light, provided the opening be extremely small. In this case the rays can converge and design the image of the object on a screen appointed for that purpose without needing to pass through refracting media. We imagine, then, that the person affected by cataract may acquire the habit of giving to the pupil a degree of contraction greater than in the normal state, and may thus in some cases succeed to a certain extent in dispensing with the crystalline, and even with spectacles. But nothing has been gained by that; for this contractility of the pupil is itself one of the most remarkable properties, which has to be added to all those which we have already admired in the structure of the eye.

Yet again, the crystalline furnishes us with one of the most interesting and most striking examples of the law of finality—namely, the relation which exists between the degree of its curvature and the density of the media in which the animal is called to live. 'This lens,' says Müller, 'ought evidently to be so much the more dense and convex as there is less difference of density between the aqueous humour and the medium in which the animal lives.' This law is only evident if we admit that the crystalline has an end; for if it has none, there is no physical necessity that its convexity should be in inverse ratio to the difference of the density of the aqueous humour and the medium. Because an animal lives in the air or in the water, it does not at all follow physically that the crystalline ought to be denser and more convex; for I do not believe that it could be said that the moist media, acting

mechanically on the crystalline, determine by their pressure the precise degree of curvature which in this state of things is necessary for vision. There is, therefore, here only a relation of foresight and not of necessity. Now the law mentioned by Müller is verified by this fact: 'In the case of fishes, where the difference of density between the aqueous humour and the water in which they swim is very slight, the crystalline is spherical, and the cornea flat; with animals that live in the air, the cornea is more convex, and the crystalline more depressed.'

While playing the part of a converging lens, it has also another action, recently discovered, and which again exhibits the marvellous industry of nature. 'If we were limited to consider the eye as a camera, all whose parts were invariable, and invariably situated at the same distance from an external object, it is clear that there would only be one particular distance at which an object would be perfectly visible. But every one knows from experience that sight is far from being so imperfect. If the eye rest on an object placed at fifteen centimetres distance,—for instance, on a very brilliant metallic thread,—it sees it perfectly defined, quite as well as if it were at the distance of thirty centimetres. Let us put the same thread at the distance of forty, fifty centimetres, or even much farther, the clearness continues perfect for good eyes. The eye possesses, therefore, a faculty of accommodation, and, moreover, each of us is conscious of it. If we place two luminous points at very different distances from the eye, we feel the effort exerted in order to see successively that which is nearer and that which is more distant.[1]

This faculty of accommodation in the eye has greatly embarrassed physiologists and physicists, and various explanations of it have been proposed. It appears to be now proved that this property resides in the crystalline. Very exact experiments have shown that the crystalline is capable of

[1] *Physique*, by MM. Boutan and D'Alméida, vol. ii. p. 415, 2d edition. See the same work, Book VI. chap. vi., for the following facts.

varying the curvature of the surfaces which bound it. The will, acting on it by means not yet well known, can cause it to swell, and consequently to vary the degrees of convexity which determine the refraction of the luminous ray. These changes of curvature have been measured nearly to the hundredth of a millimetre, and they exactly correspond with those which theory requires in order that images at a varied distance may be depicted on the retina. These beautiful results are again confirmed by the case of those affected with cataract, with whom the perception of varied distance is very imperfect.[1]

I shall not insist on another remarkable property of the eye, not yet well explained, but which is indubitable—namely, what is called the achromatism of the eye. This property consists in correcting the defect of lenses, called in optics the aberration of refrangibility. When two very sharp curves are beside each other, there is drawn between them a line, more or less long, coloured with the hues of the rainbow; at least, this is what happens to images perceived by means of these lenses. Newton believed it impossible to remedy this defect of our optical instruments. Yet this has been attained to a certain extent. Lenses free from this defect are what are called *achromatic* lenses. But human art is unable to obtain a perfect achromatism. Now the human eye is achromatic: what proves it is that, looking at a white object on a black ground, we perceive no intermediary line. Perhaps this achromatism is not itself perfect, but in every case it is quite sufficient for practical use. Let us add, moreover, that this condition has not exactly the same value as the preceding conditions; for after all, if the eye were not achromatic, it would merely follow that it would see objects otherwise than it sees them, but yet it may be denied that this property renders easier the discernment of objects.

[1] It is not altogether gone, for, as I have said just now, we obtain by the contraction or dilatation of the pupil a result analogous to that which results from the curvature of the crystalline; but that result is very insufficient.

Again, let us instance the part which the external organs play in the act of vision. Without forming part of the eye, they are in some sort its protectors—*tutamina oculi*, as they are called; for example, the eyelids and eyelashes. It has long been remarked that these organs serve to prevent certain hurtful matters from entering the eye; but they were far from being suspected of playing another part, important in a very different way—namely, the property of partly arresting what are called the *ultraviolet* rays, that is to say, the luminous rays which are beyond the violet rays in the solar spectrum, —rays which certainly exist, since they exercise a chemical action on a photographic plate. Now it appears proved that these rays act in a very injurious manner on the retina. In the second place, M. Janssen has proved by numerous and precise experiments that these protecting media have the power of arresting almost the whole of the obscure radiating heat which always accompanies the light in considerable proportion. Now these caloric rays might alter the very delicate tissue of the retina, and thus, thanks to those organs which appear accessory, the only radiations which are transmitted to the nerve are those which are capable of producing vision without altering the organ. These last facts suffice to show what combinations have been needed to render the eye fit for the eminent function it fulfils in the organism.

We have naturally insisted on the organ of sight, as being of all others that which presents the greatest number of adaptations, and in the most notable conditions. We can, however, make analogous observations on the organ of hearing, although it presents circumstances less favourable and less salient.

Now, it required a special apparatus to secure the reproduction of images, and to pass from diffuse to distinct vision; but for hearing, the point is merely to have apparatus conducting sound; and as every kind of matter conducts the waves of sound, hearing is already possible, whatever be the structure of the auditory organ. However, there are in this

case also precautions to be taken, and the most important relate to the difference of the media in which the animal lives. Let us hear Müller again on this point:

'With the animals which live in the air, the sound-waves of the air reach first the solid parts of the animal and the auditory organ, and thence they pass to the lymph of the labyrinth. The power of hearing of an animal which lives and hears in the air ought, therefore, to depend on the degree in which the solid parts of its auditory organ are fitted to receive aerial waves, on the diminution which the movements of vibrating molecules experience at the moment when the vibrations pass from the air into the external parts of the auditory organ, and on the degree of fitness of the labyrinthine lymph to receive vibrations from the external parts of the auditory organ. *The whole external part of the organ of hearing is calculated with a view to render easier the vibrations of the air on solid parts, a transmission which in itself presents difficulties.*'

'With the animals that live and hear in the water, the problem is quite different. The medium which transmits the vibrations of sound is the water; it brings them to the solid parts of the animal's body, whence they come once again into water, into the lymph of the labyrinth. Here the acuteness of hearing depends on the degree of aptitude possessed by the solid parts of the auditory organ, which the waves of sound require, in the first place, to traverse to receive waves from the ambient water, in order to transmit them anew to the water, and on the diminution which the vibrating molecules undergo during this passage. *We will perceive here again that the whole external part of the auditory organ is calculated to the end of facilitating this transmission.*'[1]

It is evident that the conditions of hearing are perfectly appropriate to the two media in which the animal behoves to live. Let it be explained, then, how a purely physical cause, which had had no regard to the nature of the media, should

[1] Müller, French translation, vol. ii. p. 404.

have coincided so justly with the nature of the organ; how, for example, it does not happen that the two systems are interchanged, and how they do not meet by chance, whether in the air or in the water; how, on the other hand, the system suitable for the air is only met with in the air, and reciprocally. But, it will be said, animals with which this mistake had occurred, being thereby deprived of that means of preservation or of defence, would necessarily perish; and this is why we see no trace of them. But I do not at all see why animals should perish because deprived of hearing, for great numbers of them are in this condition. Besides, this disadvantage might be compensated by other means of defence and preservation. And consequently there is still room to ask why the structure of the ear is found so perfectly fitted for its use. A cause entirely physical and mechanical gives no account of so exact a coincidence.

I fear I would fatigue the reader were I to review with such detail all parts of the organism: there are few of them regarding which one could not make observations of the same kind. I shall only mention the most striking and decisive facts.

1. The shape of the teeth, so apt for cutting, tearing, and grinding, and which are so appropriate to the diet of the animal that Cuvier thought them one of the most decisive and characteristic signs of the animal; the mode of their insertion and the solidity of their base, so agreeable to the laws of mechanics, and so well proportioned to their use; the protecting enamel which covers them, and which takes the place of the membrane called *periosteum*, which covers the other bones, but which would not have been here fit for the purpose of the teeth, because of its sensitiveness and delicacy.

2. The epiglottis, which serves in some sort as a door to the trachea, which shuts like a kind of bridge when food enters the œsophagus, and opens of itself as if by a spring when the food has passed, in order that the respiratory function be not interrupted. Magendie thought that the removal of the epiglottis did not hinder the function of deglutition.

M. Longet has qualified this assertion. He observed after the excision of the epiglottis in dogs, that if solid food continues to pass easily, it is not the same with liquids, the swallowing of which is followed by a convulsive cough. He states a great number of pathological facts in support of this assertion, and concludes that they were mistaken who regarded the epiglottis as not necessary to the integrity of deglutition. 'That organ serves,' he says, 'to direct the drops of liquid into the two channels of the larynx, which after deglutition flow along the inclined plane from the base of the tongue, and to prevent their falling into the subglottic vestibule.'[1]

3. The circular and longitudinal fibres of the œsophagus, which, by their peristaltic motion, determine the descent of the food, an effect which gravity itself would not suffice to produce, especially in the case of other animals than man: thanks to this mechanical combination, œsophagic deglutition is possible, despite the horizontal situation of the œsophagus.[2]

4. The valves of the veins and of the chyle-bearing vessels, all opening like sluices towards the heart, allow the chyle or the blood to ascend when pressed by the contractions of these vessels, but by closing after they have passed prevent reflux, which would otherwise necessarily take place in virtue of the law of gravitation. We know it was the sight of these valves which led Harvey to the discovery of the circulation of the blood. Besides, these valves have the function of dividing into spaces the column of blood, that it may not press with all its weight on the lower parts.

[1] Longet, *Traité de physiologie* (2d edition), t. i. 2d part, 'Deglutition.'

[2] Not only the structure of the organism, but even the history of the functions has its adaptations and skill, which imply a certain finality. 'As Berzelius remarks, nature *has taken care* to alternate the reactions in the successive parts of the digestive tube, *in order* thus to bring about at *the right time* the production of the different juices necessary for digestion. The reaction is alkaline in the mouth, and the food, on being impregnated with saliva, carries the same reaction into the stomach, where it thus evokes the secretion of the gastric juice. There the food becomes acid under the influence of the same gastric juice . . . and on reaching the end of the duodenum, it immediately occasions a considerable secretion of bile, which once more changes its reaction, and makes it become alkaline.'—Cl. Bernard, *Leçons sur les propriétés des tissus vivants*, p. 235.

5. The structure of the heart, so admirably adapted to the great function it fulfils in the organism: its division into two great cavities, the right and the left, without communication with each other, as the blood must not pass from the one to the other; the subdivision of these two cavities into two others, auricles and ventricles, whose motions alternately correspond—the contraction of the auricles corresponding to the dilatation of the ventricles, and reciprocally; the concentric and radiating fibres of which the walls of the heart are composed, fibres whose action, indeed, is not perfectly known, but which contribute without any doubt to the double motion of *systole* and *diastole*, which is the principal motive power of the circulation; the tricuspid valve, which prevents the blood from returning from the right ventricle into the right auricle, and the sigmoid valves, which prevent it from returning from the pulmonary artery into the same ventricle; and in like manner, for the other side, the mitral valve, which prevents the blood from returning from the left ventricle to the left auricle; and the sigmoid valves, which permit it to enter the aorta without coming back.

To explain without a final cause a mechanism so complicated, and at the same time so simple,—simple in principle, complicated by the number of parts in operation,—one must suppose that a physical cause, acting according to given laws, has hit upon, without having sought, the system of all others the fittest to permit the circulation of the blood, while other causes, equally blind, determine the production of the blood, and make it flow, in virtue of other laws, in channels so well placed; and then that this blood, flowing in these channels, was again found, from other circumstances, and by an unforeseen coincidence, useful and indispensable for the preservation of the living being. How is it conceivable that so many diverse causes, acting without an end, should coincide so well in their common action with that end? Remember we have the right to say here, as men of science

do in similar circumstances, that all takes place *as if* the cause of these phenomena had foreseen the effect which they behoved to produce: would it not be strange that a blind cause should act precisely in the same manner as one not blind would do? Consequently, until it be proved that such facts have not been foreseen, the presumption is that they have been. It lies with those who deny it to furnish the contrary proof: *Neganti incumbit probatio.*

6. The structure of the respiratory apparatus, where there meet, on the one hand, the vessels which bring the blood, and, on the other, the vessels which bring the air, each pulmonary cell receiving both at once; the arrangement of the ribs, of the sternum, of the collar bones, and the diaphragm, susceptible of a double motion, corresponding to inspiration and expiration; the complicated network of nerves and muscles which serve to determine that double motion. Add to this, the admirable adaptation of the respiratory system to the medium in which the animal is called to live: for the air, the pulmonary apparatus; for the water, the apparatus of gills. It is quite certain that an animal which lives in the water could only breathe air on condition of having its head constantly out of the water, which would be contrary to its preservation, supposing it could only find its food in the water itself. There would thus be an incompatibility between its nourishment and respiration. Yet this system is met with in some animals—whales, for instance—which only need to breathe at certain intervals. But the simplest plan was that the animals should breathe in the same element in which they are called to live. This is the problem which is solved by the second system, 'a combination of plates, of gills, combs, bunches, cilia, feathery excrescences—in a word, forms so varied, that nature seems to have determined here to solve the problem of realizing all imaginable ways of augmenting the surface by external projections.'[1] The water passes between these plates, and the absorption of oxygen takes place by a

[1] Müller, t. i. l. ii. § i. chap. ii.

sort of endosmose through the membranes which cover the blood-vessels.

7. The structure of the organs of motion,—a structure capable, indeed, of the most varied forms, but of which 'the essence consists,' according to Müller, 'in almost all animals, and despite the diversity of the forms of displacement by swimming, creeping, flying, or walking, in this, that certain parts of their bodies describe arcs, whose branches extend after being stayed on a fixed point. Sometimes these arcs are produced by the body itself, which is vermiform, as in creeping and swimming; sometimes the extension and flexion result from the approach and removal of the two sides of an angle, in which case one of the two sides forms, by means of the resistance which the solid or liquid bodies oppose to it, the fixed point starting from which the other parts are carried forward by the opening of the angle. To this are reducible the motions in the water, the air, or on the earth, of animals provided with members, fins, wings, or flaps. For the air and water also oppose resistance to bodies that seek to displace them, and the force which tends to resist them reacts in proportion to that obstacle on the body of the animal to which it imparts an impulse in a definite direction.'[1] Thus, whatever be the species of motion which animals have to execute, they must always obey the laws of mechanics; and consequently the combination of forces by which their organs are impelled, and the form of these organs, behove to be in accordance with the kind of motions they accomplish, which, in its turn, is adapted in a great measure to the medium which they inhabit and to the species of sustenance which they use. As to the exceptions to this law which may have been adduced, we have seen that they were reducible to the rule.[2]

8. The apparatus of the voice in man. 'In studying the voice of man,' says Müller, 'one is struck with the infinite art with which the organ that produces it is constructed. No

[1] Müller, t. ii. l. iv. § ii. chap. iii. p. 105, in French translation.
[2] See above, p. 44.

instrument of music is quite comparable to this; for organs and pianos, despite all their resources, are imperfect in other respects. Some of these instruments, like mouth-pipes, do not permit us to pass from piano to forte; in others, as in all those which are played by percussion, there are no means of maintaining the sound. The organ has two registers—that of the mouth-pipes, and that of the reed-pipes; in this point of view resembling the human voice, with its chest register and falsetto. But none of these instruments combines all advantages like the human voice. The vocal organ has, above them all, the advantage of being able to give all the sounds of the musical scale, and all their shades, with a single mouth-pipe, while the most perfect of reed-instruments requires a separate pipe for each sound.'[1]

In fine, to these precious advantages of the vocal organ of man, we must add another much more considerable still,—the faculty of articulation, so marvellously adapted to the expression of thought that it has been said that thought is impossible without speech,—a union, moreover, which is not only philosophical but physiological, paralysis of the brain having, as a consequence, the suppression or embarrassment of speech.

9. The sexual organs, on which we need not insist after the exposition of this point given in the previous chapter.[2]

10. Finally, the admirable harmony of the whole system, and the correlation of the parts, a fact for which we also refer to considerations already stated.[3]

II. *The Instincts.*

Another system of facts, on which is founded the theory of finality, is instinct in animals, as well as the different species of instincts. This kind of facts it is so much the more important for us to establish, that the principal presumption on which we shall have to depend, in order to establish the finality of the organism, will be the analogy of function with instinct. This is not the place to unfold

[1] Müller, t. ii. l. iii. § iv. chap. ii. p. 197.

[2] See p. 51.

[3] See also the previous chapter, p. 48.

a theory of instinct; we shall content ourselves with borrowing from the naturalists what can be most certainly or most probably known, whether of the nature of that force or of its different species.

'The character which, above all, distinguishes instinctive actions,' says Milne-Edwards, 'from those which may be called intelligent or rational, is that they are not the result of imitation and experience; that they are always executed in the same manner, and, to all appearance, without being preceded by the foresight either of their result or of their utility. Reason supposes a judgment and a choice; instinct, on the contrary, is a blind impulse which naturally impels the animal to act in a determinate manner: *its effects may sometimes be modified by experience, but they never depend on it.*' [1]

Indeed, if there is a theory manifestly contrary to the facts, it is that which would explain instinct by the individual experience of the animal. Let us hear Réaumur:

'Hardly are all the parts of the young bee dried, hardly are its wings in a state to be moved, when it knows all it will have to do during the rest of its life. Let us not be astonished that it is so soon so well instructed; it has been so by Him who formed it. It seems to know that it is born for society. Like the others, it leaves the common habitation, and goes, like them, in search of flowers. It goes to them alone, and is not embarrassed to find its way back to the hive, even when it seeks to return to it for the first time. If, then, it goes to draw honey from the heart of open flowers, it is less to feed itself than to commence to work for the common weal; for, from its first journey, it sometimes makes a collection of beeswax. M. Maraldi assures us that he has seen bees return to the hive loaded with two large balls of this substance the same day they were born.' [2]

The same author says again, regarding wasps: 'I have seen these flies, from the very day they were transformed, going to

[1] Milne-Edwards, *Zoologie*, § 319, p. 228.
[2] Réaumur, *Hist. des insectes*, t. v. mem. xi.

the country and bringing food back from it, which they divided among the grubs.'

Take the testimony of another naturalist:[1]

'How does the moth act on quitting its egg quite naked? Hardly is it born when it feels at once the inconvenience of its nakedness, and an internal sensation excites it to industry to clothe itself. It makes itself a coat, and when it becomes too small, it has the art of cutting it above and below, and enlarging it by adding two pieces. The moth's mother took the precaution to deposit this egg in a place where the newly-born moth could find stuff from which to make a coat and derive its food. . . . The spider and the ant-eater have not yet seen, much less tasted, the insects which behove to serve for their food, when they already hasten to lay snares for them, by weaving webs and digging pits. . . . How could a worm, only a few days in existence, and which from the moment of its birth has been buried in some subterranean cavern, have invented such an industry (that of spinning cocoons), or how could it have acquired it by instruction or example? The same is the case with animals the incubation of which is effected in the sand by the rays of the sun. Hardly are they hatched, when they go without a leader and cast themselves into the waters. . . . The celebrated Swammerdam made this experiment on the water-snail, which he took quite formed from the matrix. Hardly was this little animal thrown into the water, when it began to swim and to move in all directions, and to make use of all its organs as well as its mother. It showed quite as much dexterity as she, alike in withdrawing into its shell in order to go to the bottom, or in coming out of it in order to ascend to the surface of the water.'

These testimonies and experiments decidedly attest that the instincts are *innate* capacities, and, consequently, that nature receives from nature either a hidden force or an unknown mechanism, which spontaneously, without imitation, habit, or experience, accomplishes a series of acts adapted to

[1] Reimar, *Instincts des animaux*, t. i. § 54 sqq.

the interest of the animal. Instinct is therefore an art, but every art is a system and chain of acts adapted to a determinate future effect. The distinctive character of finality is therefore found here in an eminent degree.

Let us proceed to the analysis and enumeration of the principal instincts. We may divide them into three classes: 1st, Those which relate to the preservation of the individual; 2d, Those which relate to the preservation of the species; 3d, Those which refer to the mutual relations of animals. In other words, *individual* instincts, *domestic* instincts, *social* instincts. Such are the three chief classes to which all instincts may be reduced.[1]

Instincts relating to the preservation of the individual.

1. Inclinations to feed on certain definite substances. 'Smell and taste are the instruments which direct them in their choice; but we can only attribute to a particular instinct the cause which determines them only to eat substances which act on their senses in this or that manner. And what is remarkable, it sometimes happens that this instinct changes its direction all at once, when the animal attains a certain period of its development, and causes it to abandon its original diet. For example, certain insects, carnivorous in their state of larvæ, become herbivorous in the perfect state, and reciprocally.'

It will be observed regarding this first species of instincts, that even if they could be explained by smell (each species being thus guided by the sensations which please it), we would still have to understand how the smell is found agreeing with the interest of the animal, and how it does not incline to injurious and deleterious substances; for there is no necessary relation between the pleasure of an external sense and the needs of the internal organization. This exact adaptation appears, therefore, to be the result of a pre-established harmony.

[1] Milne-Edwards, *Zoologie*, § 320, p. 226. See the same work for the facts which follow.

2. Means employed by carnivorous animals to secure their prey. Some of the best-known examples are as follows:—

'The ant-eater moves slowly, and with difficulty. Moreover, its instinct inclines it to dig in fine sand a little pit in the shape of a funnel, then to hide at the bottom of this trap, and to wait patiently till an insect falls over the little precipice it has thus made; and if its victim seek to escape or stop in its fall, it stuns it and rolls it to the bottom of the hole, throwing over it, by means of its head and its mandibles, a quantity of sand.' 'Certain spiders prepare snares still more singular. . . . The arrangement of the web varies according to the species, and sometimes presents no regularity; but at other times it is of the utmost elegance, and one is astonished to see such little creatures construct with such perfection so extensive a web as that of the spider of our gardens. There are spiders that make use of their web to swathe their victims.' 'Certain fishes have the art of throwing drops of water on the insects which are upon aquatic herbs, in order to make them fall.' One might cite a thousand instances besides of ruses of animals, the same in the whole species, and employed by the young prior to any imitation and experience.

3. Instinct of accumulation.

'During summer, squirrels collect stores of filberts, acorns, or almonds, and make use of a hollow tree as a magazine. They are accustomed to make several deposits in several different hiding-places, and can always find them in winter, despite the snow.'

'Another rodent (Siberia), the *lagomys pica*, gathers in autumn the grass it will need during the long winter of that country, like our farmers. Having cut the strongest and most succulent herbs, it spreads them out to dry in the sun. It then collects them in ricks, which it shelters from rain and snow. It then digs underneath each of these magazines a subterranean passage, terminating in its hole, and so arranged as to allow it from time to time to visit its store of provisions.'

4. Instinct of construction.

'The silkworm constructs a cocoon for its metamorphosis; the rabbit, a burrow; the beaver, its huts.' 'The German mole constructs an abode affording two exits,—the one oblique, to cast out the loose earth; the other perpendicular, to go in and out. These passages conduct to a certain number of circular excavations, which mutually communicate by horizontal conduits. One is the abode of the mole, the others its magazines.'

'Some spiders (*mygales*) construct a habitation the opening of which they skilfully close by means of a veritable door, furnished with its hinge. For this end they dig, in a clayey soil, a sort of cylindrical well of about eight or ten centimetres long, and plaster its walls with a kind of very stiff mortar. They then make, with alternate layers of miry earth and woven threads, a covering which exactly fits the orifice of the hole, and which can only open outwards. The hinge which holds this door is formed by a continuation of filamentary layers, which extend from a point of its surface to the walls of the tube situated beneath, and there form a pad answering the purpose of a frame. The external surface of this covering is wrinkled, and scarcely to be distinguished from the surrounding earth, but the inner surface is smooth; and one may notice on the side opposite the hinge a range of little holes, into which the animal puts its claws to keep it shut when some enemy seeks to open it by force.'

Among the instincts of construction one of the most remarkable is that of bees. 'It is a very curious problem of mathematics to determine at what precise angle the three planes which compose the bottom of a cell ought to meet, to afford the greatest economy or the least possible expense of materials and work. This problem belongs to the transcendental part of mathematics, and is one of those called problems of *maxima* and *minima*. It has been solved by some mathematicians, particularly by the able Maclaurin, by the infinitesimal calculus, and this solution is to be found in the *Transactions* of

the Royal Society of London. This scientist has fixed precisely the required angle, and he found, after the most exact measurement which the subject admitted of, that it is the very angle at which the three planes of the bottom of the cell in reality meet.'

'Shall we ask here who taught the bee the properties of solids, and to resolve problems of *maxima* and *minima?* . . . We need not say that bees know none of these things. They work most geometrically without any knowledge of geometry; somewhat like a child, who, by turning the handle of a barrel-organ, makes good music without any knowledge of music.'[1]

5. Instinct of clothing.

'In insects we likewise see a great number of curious methods instinctively employed for the construction of a dwelling. Many caterpillars can make themselves a covering by rolling leaves together and fastening them by means of threads. In our gardens we will constantly meet nests of this sort on lilacs, gooseberry bushes, etc.; and of this kind also is formed that which is found on the oak, and which belongs to the caterpillar of a little nocturnal butterfly, the *tortrix viridissima.* Other insects construct nests with fragments of leaves, bits of stuff or some other substance, which they have skill to adjust artistically. Such is the common moth, a little grey silvered butterfly, which, when in the state of caterpillar, cuts passages in the thickness of woollen stuffs, rapidly gnawing them. With the bits thus detached the caterpillar makes a pipe, which it continually lengthens at the base; and, what is singular, when it becomes too large to be at ease in its dwelling, it breaks this sort of sheath, and enlarges it by adding a piece.'

Instincts relating to the preservation of the species.[2]

1. Precautions for laying eggs.

[1] *Works* of Reid (by Hamilton, ii. 546). A Swiss geometrician has tried to show that this calculation was not exact, and that the geometry of the bees was imperfect. Lord Brougham resumed the problem, and has shown that the bees 'were right.'

[2] Milne-Edwards, § 327.

'One of the phenomena fittest to give a clear idea of what ought to be understood by instinct is that which is presented to us by certain insects when they lay their eggs. Those animals will never see their progeny, and can have no acquired notion of what their eggs will become; and yet they have the singular habit of placing beside each of those eggs a supply of elementary matter fit for nourishing the larva it will produce, and that even when that food differs entirely from their own, and the food they deposit would thus be useless for themselves. No sort of reasoning can guide them in doing this, for if they had the faculty of reason, facts would be awanting them to arrive at such conclusions, and they must needs act blindly.'

Necrophores. 'When the female is going to lay, she always takes care to bury the body of a mole or of some other small quadruped, and to place her eggs in it, so that the young find themselves from their birth in the midst of matter best fitted for their food.'

Pompiles. 'At the full age they live on flowers; but their larvæ are carnivorous, and their mothers always provide for their nourishment by placing beside their eggs, in a nest prepared for this purpose, the bodies of some spiders or caterpillars.'

Xicolopes. 'This insect lays its eggs in pieces of wood. It makes on the free part of pieces of wood—a vine pole, for instance—a vertical hole, which becomes the entrance of a passage, which the xicolope digs to a great depth. When this channel is of the required depth, the insect deposits in the lower part a first egg and a certain quantity of alimentary matter. It fixes above this egg a transverse partition with saliva and the powder of wood; then above this partition it lays a second egg, makes a new partition, and so on to the entrance of this kind of well. In fine, we may mention that the xicolope has taken care to pierce at the level of each cell a passage perpendicular to the vertical direction of the cells, and leading from the interior of the cell to the outer surface of the piece of wood. In this manner the insect, when

once its metamorphoses are finished, can easily emerge from its cell.'[1]

2. Construction of nests.—It were needless to insist on the marvels of the construction of nests; let it suffice to cite some examples.

'One of the most remarkable nests is that of the *saya*, a little Indian bird near akin to our bullfinches. Its form is nearly that of a bottle, and it is suspended on branches so flexible, that apes, serpents, and even squirrels cannot approach it; but to render it more inaccessible to its numerous enemies, the bird places the entrance to it underneath, so that it can only itself enter it flying. Inside there are found two chambers, one of which serves the female to hatch her eggs; the other is occupied by the male, who, while his companion fulfils her maternal duties, cheers her with his songs.'[2]

'The *sylvia sutoria*, a charming tom-tit, takes two very long, lanceolated leaves of a tree, and sews their edges carefully together by overcasting, by means of a piece of flexible grass in place of a thread. After this the female fills with cotton the species of little sac thus formed, and places her progeny in this soft bed.'

'The *loriot* of our climes performs a similar act. . . . But it is remarkable that it does not fasten its nest with grass, but with ends of twine or cotton thread which it has stolen from a neighbouring house; and the question is, how it did before industry invented pack-thread or spinning.'[3]

'The *crested grebe* hatches its young in a veritable raft which floats on the surface of our ponds. It is a mass of large stalks of aquatic herbs; and as these contain a very considerable quantity of air, and disengage besides in decaying various gases, these gases, being confined by the plants, render the nest lighter than the water. It is found floating on the surface in solitary places, filled with tall rushes and great reeds. There, in this improvised ship, the female on her

[1] Vulpian (after Réaumur), *Physiologie du système nerveux*, p. 897.
[2] Milne-Edwards, p. 240. [3] Pouchet, *l'Univers*, p. 143.

moist bed warms her young; but if some disturber comes to discover her, if anything threatens her security, the wild bird plunges one of its feet into the water, and uses it as an oar to remove its dwelling to a distance. The little boatman conducts his frail skiff where he pleases. . . . It is a little floating isle.'[1]

3. Villa architecture.—Independently of nests, those useful and necessary structures, actual pleasure-gardens are found among birds.

'The cleverest of these hedge-makers, these Lenôtres of ornithology, is the *speckled chlamydere*, which much resembles our partridge. The couple proceed with order in constructing their grove. It is usually in a bare locality they place it, for the sake of the sun and light. Their first care is to make a causeway of rounded pebbles, nearly equal in size. When the size and thickness of this appear to them sufficient, they commence by planting there a little avenue of branches. They are seen bringing from the fields, with this view, small shoots of trees about the same size, which they thrust firmly by the thick end into the interstices of the pebbles. These birds arrange the branches in two parallel rows, making them all converge towards each other, so as to represent a hedge in miniature. This improvised plantation is almost a metre in length, and its size is such that the two birds can play or walk abreast under the protection of its shade.

'The grove once finished, the loving couple begin to think of embellishing it. For this end they wander all round the country, and steal every shining object they meet with, in order to ornament its entrance. Shells with shining mother-of-pearl are above all the object of their desire.

'If these collection-makers find in the country pretty birds' feathers, they gather them and hang them instead of flowers on the faded branches of their dwellings. It is even certain that in their neighbourhood every brightly-coloured object with which the soil is artificially strewed is immediately

[1] Pouchet, *l'Univers*, p. 153.

removed by them. Gould (who discovered these groves) informed me that if a traveller loses his watch, knife, or seal, they are found in the nearest promenade of chlamyderes of that district.'[1]

III. *Instincts of society.*

We shall not much insist on this third class of instincts, it being less significant from our point of view, which is not to find *impulses* in animals which should astonish us, but to find impulses which of themselves, spontaneously, and without study, light upon the surest *means* for their satisfaction. This innate finding of means, which cannot be attributed even to the imitation of animals, for they are born with it, ought therefore to be put to the account of nature. In this sense the social instincts have perhaps less value than the preceding facts. Let it suffice us to distinguish two sorts of societies among animals, the one *accidental*, the other *permanent*. 'In the first class will be ranked the companies of hyenas and wolves, which collect to hunt and then separate; those of migratory animals (swallows, pigeons, locusts, herrings), which only unite for the journey and separate at the end of it; the pleasure parties of paroquets, that assemble to bathe or play in the water and then separate. In the other class will be reckoned the well-known colonies of the beavers, wasps, bees, and ants.'[2]

The enumeration of facts contained in this chapter is far from being so complete as would be necessary in a dogmatic work, but it suffices for an essay of critical teleology such as we have attempted here. The philosophical and critical analysis of finality ought not to be swamped in the description of facts; but, on the other hand, it might appear too dry and abstract if we too much neglected this help. Between these two extremes of excess and defect we have sought, and we hope we have found, the just medium. We can now resume the series of our inductions and reasonings.

[1] Pouchet, *l'Univers*, p. 153. One of these groves has been brought by Gould to the British Museum.

[2] Milne-Edwards, p. 244.

CHAPTER III.

THE INDUSTRY OF MAN AND THE INDUSTRY OF NATURE.

WE have in a previous chapter (chap. i.) founded the existence of the final cause on this principle, that when a complex combination of heterogeneous phenomena is found to agree with the possibility of a future act, which was not contained beforehand in any of these phenomena in particular, this agreement can only be comprehended by the human mind by a kind of pre-existence, in an ideal form, of the future act itself, which transforms it from a result into an end—that is to say, into a final cause.

Perhaps this conclusion will be found premature; for, it will be said, the agreement in question doubtless demands an explanation, and no one pretends that adaptation is a phenomenon without cause, but to affirm that the cause of the adaptation is precisely the future effect itself, in the form of ideal anticipation, and that a complex combination cannot be found in agreement with an ulterior phenomenon, without this phenomenon being considered as itself the cause of that combination, is precisely what is in question. On what do you rely, we shall be asked, to give to this future phenomenon, which only appears to us an effect, the privilege of a cause? Granted there is a cause; but why should it be a final rather than an efficient cause? Whence do you derive this right to seek the cause in the future rather than in the past?

It must be confessed that, if experience had not given us beforehand somewhere the type of the final cause, to all appearance we never could have invented this notion. We do not know beforehand and *à priori* that every agreement of a phenomenon with the future supposes an end; but this

agreement requiring to be explained, we explain it after the model which we find in ourselves, when we make some combination with a view to the future. The foundation of this conclusion, accordingly, as has always been thought, is analogy.

Bacon recommends, when we wish to prove the existence of a certain cause, to seek some fact in which this cause is manifested in a very visible and entirely incontestable manner. Those facts in which the cause sought is more salient than in all others, Bacon calls *clear* or *prerogative* facts; there are numerous examples of them in the sciences. Now, for the final cause we have before our eyes a fact which truly deserves the name of a *clear* and *prerogative* fact, namely, the fact of human art. It is from this fact that we pass by way of analogy to other facts, less evident, but similar. This transition common sense has effected from the earliest times without the least scruple; philosophy on this point has followed common sense. Do strict reason and a sound logic authorize, do they justify, such a procedure?

It is objected that it is not allowable to pass by way of analogy from the industry of man to that of nature; that we have no reason to think that nature acts in the production of her works as man acts in the production of those proper to him. Such is the objection of the Epicureans and of David Hume, adopted later by Kant and by all the Hegelian school.

It is important to remark, first, that this objection may have two senses, and serve to establish two very different conclusions. It can bear either against *finality* or against *intentionality*. In the former case it would mean, as the adherents of absolute mechanism maintain, that there is no final cause at all in nature, but only consequences and results. In the latter case it would signify that there may be final causes in nature, but that one is not bound to refer them, as one does in the case of human works, to an intelligent cause; and that it is not proved that an acting cause cannot pursue ends unconsciously. The first sense is that of Epicurus, and of

modern Positivism; the second is that of Kant, Hegel, Schopenhauer, and all German philosophy. We have above very carefully distinguished these two problems. The question at present is only about the first sense: it is about finality, not intentionality; it is not how the first cause acts, but whether the second causes, as they are given to us in experience, act for ends or not. Within these limits, is the analogy between the industry of man and that of nature legitimate? This is at present the only question before us.

Either the preceding objection signifies nothing, or it consists in placing in opposition to each other nature and man, as two terms heterogeneous and without analogy. It consists in opposing as two worlds, the world of mind and the world of nature, and in affirming that there is no passing from the one to the other. In fine, this objection taken strictly would mean that there are two creative causes, man and nature; that man has productions which are proper to him, and that nature has them as well; that there are two industries opposed to each other; and that, not knowing how nature acts, we cannot attribute to it the mode of action of human industry.

Reduced to these terms, this objection evidently falls before this very simple consideration, namely, that man is not outside of nature, opposed to nature, but that he himself forms part of nature,—that he is a member, an organ, and in a certain measure a product of it. His organism is adapted to the external medium in which he lives. He undergoes and accepts all the conditions of the physico-chemical laws; these laws are fulfilled in the organism itself as well as outside it. Moreover, all the laws of life in general common to vegetables and animals, and all the laws proper to animals, are fulfilled in him as in all the beings of nature. His soul is not independent of his body: by perception and imagination he plunges into purely organic life; reasoning and art are connected with imagination, with memory, and with perception. The pure reason itself is connected with all the rest; and if

by the most elevated part of his being he belongs to a higher world, by his roots he clings to the world where he lives.

Not only is man within nature, but his acts and works are within nature, and thus human industry itself is within nature. One is astonished to see nature and art constantly opposed till the 18th century, as if art were not itself something natural. Wherein are the towns built by man less within nature than the huts of beavers and the cells of bees? In what respect should our cradles be less natural than the nests of birds? In what respect are our clothes less natural than the cocoons of the silkworms? In what respect are the songs of our artistes less natural than the song of birds? That man is superior to nature not only in the moral and religious sphere, but also in the very sphere of industry and art, is not doubtful; it is not less true that on this last field, save in degree, man comports himself entirely as a natural agent.

This point well established, we have reduced to its proper terms the induction which warrants us to transfer the final cause from ourselves to nature. Experience, we shall say, presents to us conspicuously in a given case a real and certain cause, which we call final cause; is it not legitimate to suppose the same cause in analogous cases, with a degree of probability increasing and decreasing with the analogy itself? We do not, then, pass from one genus to another; but in the same genus, namely nature, a certain number of homogeneous facts being given, we follow the course of the analogy as far as it can conduct us, and up to the point where it leaves us. Such is, in truth, the inductive method which the human mind follows in affirming final causes outside of us. The detailed analysis of this method will enable us better to understand its range and exactness.

We have said we must set out from the principle of human industry, but, strictly speaking, we must go back farther still. What we call human industry is not, properly speaking, a fact, but is itself a mediate conclusion obtained by way of analogy. Indeed, what passes in the soul of our fellow-men is absolutely

unknown and inaccessible to us, at least by way of direct observation. We see only their acts and the external manifestations of their feelings and thoughts. In calling certain of these actions by the names of *industry* and *art*, we mean that these actions are collected co-ordinations towards an end,—that is to say, phenomena determined by the idea of the future, and in which the consequent is the determining reason of the antecedent. But this is only a supposition; for, not having any direct experience of the efficient cause of these phenomena, we cannot absolutely affirm that that cause has proposed to itself the end which it seems to pursue, nor even that it has purposed any end. Sometimes we even err in thinking that we see an end where there is only blind mechanism. For instance, I have somewhere quoted the case of an old curate who had become insane, and who used to recite with the utmost eloquence the famous exordium of Father Bridaine. To hear him, it would have been impossible not to suppose that he knew what he was doing, and that his object was to move his auditors. And yet with him it was an act entirely automatic, for not only was he insane, but had reached the last stage of what is called *senile dementia*, which is entire imbecility; he was unable to say two sensible words, and even to utter them, and yet the old mechanism still went, and seemed still to have the same adaptation to an end. We see from this instance how true it is that our belief in the intelligence of our fellows is an induction, and even a simple belief founded on analogy, so much so that in some cases this belief is contradicted by facts.

How, then, do we come to suppose intelligence and finality in our fellow-men? Evidently by comparison with ourselves. As the only really efficient cause which we know is ourselves, so the only final cause that is immediately perceptible to us is in ourselves. In certain cases, indeed,—for instance, in voluntary actions,—we are conscious not only of an active force that displays itself in us, but of a certain idea that serves to regulate that active force, and in virtue of which we co-ordi-

nate the internal and subjective phenomena of our mind, and consequently the corresponding motions of our organism. We give the name of *end* to the last phenomenon of the series, in reference to which all the others are co-ordinated; and this co-ordination of phenomena and of actions is explained for us in the simplest manner by the supposition of an anterior idea of the end. I know very well, for instance, that if I had not beforehand the idea of a house, I could not co-ordinate all the phenomena whose conjunction is necessary to construct a house. I know very well that it has never happened to me to succeed in making a phrase by taking words at random from a dictionary; I know that I have never succeeded in composing an air by touching at random the keys of a piano; I know that even to succeed in forming a thought I must collect divergent phenomena in a common idea; I know that I cannot co-ordinate the elements of matter in a whole, without having previously formed an idea of that whole. In a word, I know that with me every induction, and every art, supposes a certain end, a certain finality, or, as we have expressed ourselves, a certain determination of the present by the future.

In truth, there occur in me—more rarely, doubtless, than in the animals, but yet often enough—phenomena which present co-ordinations similar to the preceding, without me being conscious of the end which determines them. These actions, which are called instinctive, have, therefore, as it seems, the same character as voluntary acts, and yet nothing warrants us to affirm that they are determined by the anterior idea of the end, nor even that they are determined with reference to an end; for that is precisely what has to be demonstrated.

We reply that, just because these instinctive acts of human nature are analogous to the phenomena of nature in general, whose explanation we are seeking, it is not from them we can set out to explain the others; for that would be to explain *obscurum* by *obscurum*. But apart from these instincts, we find in ourselves, in a notorious and striking case, the existence of a real cause, which is finality, and whose criterion

is the co-ordination of the present to the future in respect of an anticipated idea: such is the character of voluntary activity.

There is, therefore, at least one case in which the final cause is established by experience, namely, the case of our personal and voluntary activity. From this centre we can radiate around ourselves; and the first certain step which we take beyond ourselves is to affirm intelligence, causality, desire, and, finally, finality, in our fellows.

In fact, when we see in other men a succession of acts co-ordinated as our own are in the case of voluntary activity,—for instance, when we see a man walking in the street, speaking, moving his limbs in a regular manner, bringing bodies together with order and method, putting stones upon each other, planks between the stones, iron between the planks, or tracing characters on the sand or upon paper, marks upon canvas, covering these marks with colour, cutting stone, giving it this or that form, etc.,—when we see, I say, all these actions, although we were not present at the internal scene which passes in the mind of these agents like ourselves, and although by way of exception we might be mistaken, yet in the immense majority of cases we are warranted to suppose—and we do suppose with absolute certainty—that actions like all those we have just mentioned, and which are themselves like our voluntary actions, are actions determined by an *end*. We suppose, therefore, in the case of other men the final cause as with ourselves; and this is a first and certain extension of the idea of finality.

That is not all: we do not even need to witness the series of actions of our fellows to conclude that there is an end; and, with time and habit, it suffices us to see the result of them, to assume in the very product of human activity means and ends. This is, in fact, one of the characteristics of human activity, that it does not shut itself up within itself, that it acts beyond itself on nature and on bodies. It is a fact that bodies are susceptible of motion; they can therefore be brought together and separated; they can be separated from

the combinations into which they naturally enter, in order to enter into new combinations. And it is a very remarkable fact, and of the highest importance for our subject, that these bodies, although blindly obedient to the laws of nature, can at the same time, without any violation of these laws, be co-ordinated according to the ideas of our mind. Thus the stones which form a house certainly obey the laws of gravity and all the laws of mechanics, and yet they are capable of entering into a thousand relations, all compatible with the laws of mechanics, and which are yet predetermined by the mind.

But, we say, it is not necessary for us to witness the active operation by which the intelligence and the will of our fellows has given this or that form to matter. Experience soon teaches us to recognise among the bodies which surround us those that are the product of nature and those that result from human art; and knowing that, as regards ourselves, it has always been impossible to realize such products without having willed them,—that is to say, without having had an end,—we accustom ourselves to regard them immediately as means for ends. Thus, as writing is for us only a means of expressing thought, we suppose, when we see unknown characters,—for instance, the cuneiform,—that they must have been means of expression, graphic signs to express thought. As we do not rear buildings by chance and without knowing why, we suppose, when we see buildings such as the Pyramids or the Celtic menhirs, that they have been constructed for an end; and we inquire what it can have been. In a word, in all the works of human industry we see means and ends; and even when we cannot discover what the end is, we are persuaded that there is one.

We regard it, therefore, as certain that, whether we consider in others the course of their actions, or consider the products of these actions, we see between these actions and our own such a similarity, that we do not hesitate to conclude in their case, as in our own, that every combination directed towards the future implies an end.

If now we descend a step, we will see in the animals a multitude of actions so like those of man that it is impossible for us not to attribute them to like causes. Wherein does the action by which an animal watches and pursues its prey, lays snares for it, surprises and devours it, differ from the action by which the hunter pursues and seizes that animal itself? Wherein does the action by which the animal hides itself, avoids the snares laid for it, invents ruses for its defence, differ from the action by which the savage seeks to escape his enemies, and the more complicated but analogous action by which the general of an army retreats before the enemy? It is the same with the most of the animal actions by which the beasts seek the satisfaction of their wants. These wants being the same as with man, although simpler, the means which satisfy them must be also the same. Hence those analogies which have struck all observers. We are therefore authorized to argue from man to the animal; and since we have seen that men act for an end, we are equally entitled to conclude that the animals act for an end.

Now, among the actions of animals we generally distinguish two kinds. In the one, the animals seem to act like man by a kind of reflection and foresight, having voluntarily arranged beforehand the means for a desired end. What characterises this sort of actions is that the animal does not perform them at first with the perfection which it will attain later. It learns, it becomes more and more skilful; experience, habit, comparison, seem to have a share in the formation of its judgments. Such, at least, is the case according to observers favourable to animals. This first sort of actions would therefore be, except in degree, analogous to the deliberate and voluntary actions of the human race.

But there are other actions, which it is said differ essentially from the preceding, although as complicated and presenting exactly the same character, namely, the adaptation of certain means to the satisfaction of a want. Here there is no education, at least apparently nothing to indicate the successive

efforts of a mind which is being formed and is learning,—nothing that is personal to the individual. The animal seems from the first to act as it will act all its life; it knows things without having learned them; it performs very complicated and precise operations with perfect correctness, almost infallibly and immutably.

Thus in the second kind of actions, called instinctive, all that we are accustomed to regard as characteristic of intelligence is awanting,—progress, fallibility, individuality, hesitation—in a word, liberty. May there be, then, a kind of intelligence of which we have no idea? Have the animals a kind of innate knowledge, and, as it were, a reminiscence analogous to that of which Plato dreamed? Have they innate habits? We do not know, and in our ignorance of the real cause of these astonishing actions, we do not seek to form any idea of it, and call that hidden cause *instinct*, whatever it may be. But if, in their origin, in their cause, these actions differ from human actions, in their intrinsic and essential nature they do not differ. On the contrary, among animal actions it is just these which most resemble the most complicated actions of human industry. Indeed, they are not merely actions, they are also productions; not only does the animal walk, fly, sing, draw near or flee, take or bring, but besides, like a veritable workman, it makes the forces and elements of nature subserve its wants. Like man, it builds; like man, it weaves and lays snares; like man, it gathers and makes storehouses; like man, it prepares an abode for its young; like man, it makes itself pleasure-houses, it makes itself clothes; in a word, it exercises all the industries. Thus these instinctive actions are at once very different from the actions of man as to their origin, and very similar as to the matter of them. Now what characterises the actions of man is to act knowingly for an end. As to the actions of which we are speaking, everything leads to the belief that they are not done knowingly. But apart from this difference, the similarity is entire. It therefore remains to be said that, without knowing

it, these animals act for an end. Thus the end which we had already recognised in the intelligent actions of animals cannot disappear merely because we here meet with a new and unexpected condition, namely unconsciousness. Instinct, then, will reveal to us an unconscious finality, but still a finality.

True, we may be stopped here by some one who might say to us, that as soon as we, by hypothesis, remove every previous idea of the end, with all foresight, and consequently all intelligence, the word finality no longer represents anything whatever, and there is nothing else than the effect of a given mechanism; that, consequently, the sequence of our inductions and analogies necessarily stops where intelligence stops; that, of course, intelligence proposes an end to itself, but that, apart from intelligence, nothing remains but causes and effects. On this supposition it would be granted that man acts for an end; that the animal itself, when it is guided by intelligence and appetite, acts for an end; but when it acts instinctively, it would be maintained that it no longer has an end, and that then its actions are developed exclusively according to the law of causality.

But who does not see that the difficulty raised would only decidedly avail against those who should believe themselves obliged to admit an unconscious finality at the origin of things, but not against those who admit an ordaining intelligence? For, in order that an object may appear to us as a collection of means and ends, that is, as a work of art, it is not at all necessary that the intelligence reside in it; it is enough if it be apart from it in the cause that has produced it. Thus, in an automaton we do not fail to recognise means and ends, although the automaton, properly speaking, acts without an end; for we know that the intelligence which is not in it is without it, and that what it cannot foresee of itself has been foreseen by another. In the same way, supposing that in the animal there is not a certain occult force virtually containing the power to act for an end,—supposing, with Descartes, that the animal, so far as it acts instinctively,

is a mere machine, and is destitute of all internal activity,—even in this case we would not have to conclude that its actions are not co-ordinated with reference to an end, since the intelligence which was not in it might very well be outside of it, in the first cause that had made it.

But we have no need here to raise these questions; we have not to interrogate ourselves on the nature and the cause of instinct, and, in general, on the primary cause of finality. We do not yet inquire whence it comes that there are ends in nature; we inquire whether there are any—whether such a fact, such an act, and such an operation, ought to be called by this name. Now why should the same fact, exactly the same, produced by means strictly similar (although the operation be instinctive, in place of being voluntary), be called in this case an *end*, in that a *result?* Why should the web of the workman be an end, the web of the spider a result? Why should men's granaries be an end, and the granaries of animals a result; the houses of men an end, the cabins of beavers a result? We therefore believe ourselves warranted to say that if intelligent actions are directed towards an end, the same actions, when they are instinctive, are equally directed towards an end.

It may be urged that it is not true that the same action which has an end when it is voluntary, must equally have one when it is involuntary; for it is precisely so far as it is voluntary that it has an end. We begin by moving our limbs without an end, before moving them voluntarily for an end; the infant cries without an end, before crying voluntarily for an end. To act for an end is to transform a natural action into a voluntary one—no volition, no end. But, considering matters more closely, it would seem that these first motions or first cries are considered fortuitous and without an end, not because they are involuntary, but because they are unregulated, spontaneous, without direction, while the voluntary motions have an order, rule, and direction. Now this is precisely what instinctive motions have in common with

voluntary,—they are not irregular movements, like those of the infant which moves in its cradle; they are combined motions, and, rigorously calculated, absolutely similar (except as to origin, which we ignore) to voluntary motions. Thus the motions of the ant, which goes for food and returns laden to the storehouse, are quite similar to the movements of the peasants, who go to make their hay and reap their harvests, and bring them to their barns; and the motions of the animal which swims without having learned, are exactly the same as those of man, who only learns to swim slowly and with many efforts.

Thus instinct supposes an end. But let us advance a step. We have passed from our personal finality to finality in other men, from finality in the industrious actions of other men to finality in the industrious actions of animals, whether these actions present the appearance of some foresight and reflection, or appear to us absolutely automatic. We have now to pass from the external actions of the animal, which are called its *instincts*, to its internal operations, which are called its *functions*. This is the kernel of our whole deduction.

On reflection, it will appear that these two kinds of operations, instincts and functions, are not essentially distinct from each other; and it is as difficult to separate instinct from function properly so called, as it is to distinguish intelligence from instinct in the animal. The name of instinct is applied more particularly to certain acts of the organs of relation, that is to say, of the locomotive organs; and so far as these acts are constituted by a series of phenomena always the same in all the individuals of the same species, we give the name of instinct to that chain of automatic acts forming a determinate whole. But wherein does this special chain differ from that other chain of acts which is called a function? Wherein does the art of weaving a spider's web differ from that of the singing of birds? and wherein does the art of singing differ from the art of seizing, of swallowing, and of distribution,

which constitute the art of self-nutrition? Is there not visible in both cases a series of phenomena connected in a constant manner and following a systematic order? and is not this systematic connection in both cases a co-ordination of phenomena with reference to a future phenomenon, which is the preservation of the animal? Whether the animal take its prey in a snare, like the spider, or take it by means of its talons, and then tear and swallow it, like the lion, each of these phenomena is of the same order as the preceding; and if it were correct to say that instinctive operations have an end, it will be equally correct to say that all the functions, which are themselves only instinctive operations, have one as well.

German philosophy has thought to establish a great difference between the industry of man and vital industry in this, that in the works of man[1] the agent is outside his work, which cannot modify itself; while, in the works of nature, the agent is hidden in the very midst of the organism, and transforms it from within and not from without. This difference, long ago specified by Aristotle, is perhaps more apparent than real, and does not concern our present question. Many functions that are internal in certain animals are external in others, and it would be very difficult to say where function commences, where industry. Incubation, which is internal in the viviparous, is external in the oviparous animals. Does the hen which hatches its eggs exercise a function or an industry? To hatch its eggs or promote the hatching of them by the heat of its body, like the hen, or to hatch the eggs and afterwards to promote the development of the young by the heat of the nest, are these essentially different phenomena? Are not the internal incubation of the viviparous, the external incubation of the oviparous, and artificial incubation by nidification, the same degrees of one and the same instinctive function? In fine, what is even human industry but a

[1] We will have occasion to revert to this question farther on (see Book ii. chap. ii. *Of Unconscious Finality*); we only handle it here in its relation to our present investigation.

development of function? What is a function but an internal industry? What do the teeth perform but a process of grinding, the heart but a work of pumping, the stomach but a chemical labour? And reciprocally, what do we do when we wear spectacles, when we apply a trumpet to our ear, when we employ the œsophagic sound, or even when we take a stick, but prolong externally the internal function? And wherein do these external means differ, except in coarseness, from the instruments created by nature itself?

Since we can reproduce each of these operations by artificial mechanical agents, why should not each of these operations be a mechanical industrial operation? Hence it follows that function being identical with instinct, instinct with the industry of man, it will be strictly true to say of function what is true of the industry of man—namely, that it is a series of phenomena determined beforehand by a last phenomenon which is the reason of it; in other words, that it is a chain of means adapted to an end.

There remains, however, a profound difference between functional industry and human—namely, that artificial industry constructs the machines it has need of to perform its operations, while the animal functions are only the operations of machines already constructed. Thus man makes pumps, but the animal has received from nature a natural pump, the heart, to cause the blood to circulate; man makes spectacles, but the animal has received ready made from nature the eyes, which are veritable spectacles, etc. This difference is considerable. But let us ascend to the origin of these natural machines. Whatever be the cause that has constructed them—be it the soul itself, as the Animists will have it, the vital force of the Vitalists, the nature of the Pantheists, the immediate act of a creator God, or even matter with its primordial properties—is of little consequence; in any case this cause, in constructing these machines, has performed a series of operations entirely resembling those of a workman constructing analogous machines. What

difference is there between the act by which nature has created a crystalline, and the act by which man constructs lenses? What difference between the act by which nature creates molar teeth, and the act by which man makes mill-stones? What difference between the act by which nature makes fins, and the act by which man creates instruments of natation?

There are two differences: the first is that nature does not know what it is doing, while man does; the second, that in the one case the implements are internal, in the other external. But these differences do not destroy the profound analogies of the two kinds of action; and there still remains in both cases a creation of machines. Now, how could the same machine be considered here as a collection of means and ends, there as a simple coincidence of causes and effects? How should the construction of an apparatus for flying infer in the case of man, if it were discovered, a miracle of genius and invention, so complicated is the problem, so difficult in this case to adapt the means to the end; and yet the solution of the same problem, found by nature itself, be the simple effect of a coincidence of causes? Can we thus assign two absolutely opposite causes to two absolutely identical actions?

As regards the two differences mentioned, let us notice first, that, between the unconscious industry which creates the organs and the human industry which creates the machines, there is placed an intermediate phenomenon, the instinctive industry of the animals. This industry is unconscious like the first, and it is external like the second. Like human industry, instinct creates for the animal supplementary apparatus, which are appendices of organs; like the vital force, instinct is unconscious, and does not know what it is doing. Is not the vital force (and I mean by that the unknown cause, whatever it be, that creates the organs) itself an instinct that assimilates the elements of external matter, to make of them the apparatus necessary to the execution of its functions? And what does it matter

whether these apparatus be internal or external? Do they change their character by being inseparable from the animal itself, that is, by being entirely bound to the organic machine, so as at once to profit and to suffer from all that happens to the whole system?

Yet once again, then, I do not ignore the differences between nature and art, and I will have occasion to revert to them later, but they do not signify here. Doubtless human works have not in themselves the principle of their motion, while nature, as Aristotle rightly says, and above all living nature, has in itself the principle of its motion and its rest. But the question, To what point is a being endowed with internal and spontaneous activity? is of a different order from this, Whether are there in that being means and ends? Now in both cases, in the works of art as well as in those of nature, there is a twofold common character: 1st, The relation of the parts to the whole; 2d, The relation of the whole to the external medium, or the objects on which it behoves to act. In a machine, as well as in a living being, each of the parts has meaning and value only by its relation to the general idea of the machine. There is no part which has not its reason in the whole. As Aristotle has said, the whole is anterior to the part; and Kant himself has recognised in this respect the identity of nature and art. Now, is not that the essential and distinctive character of finality? It is not, then, the more or less of internal activity or of spontaneity that is here in question; it is that pre-established harmony of the part and the whole, which, common at once to the works of art and to the works of nature, confers upon them, on the one as on the other, an incontestable character of finality. Besides, they both suppose external conditions which are prearranged for them. If we invoke *vitality*,[1] with the Germans, in order to explain the phenomena of life, it may be

[1] 'There is a wonderful agreement between the functions of the different organs. . . . But when we understand the essence of the organism, we find that this industrious harmony is a necessary sequel of *vitality*.' (*Phil. de la*

found that such a cause greatly resembles the occult qualities of the Middle Ages; but whatever may be the worth of this cause otherwise, it does not exclude the existence of mechanism in the living organism, and does not destroy any of the analogies we have instanced above. Doubtless there is in the eye something vital, without which it would not exercise its functions: an artificial eye could not see; but, vital or not, the eye is none the less an optical instrument, a camera obscura, exactly constructed according to the laws of physics; the crystalline, all living as it is, is none the less a lens; and all our organs, without ceasing for a moment to be living, are none the less at the same time mechanical agents strictly appropriated. Be it vitality; still it is the case that this vitality acts like a clever artist, that it prearranges all the parts conformably to the idea of the whole—in other words, that it obeys the law of finality, which is for us at present the only subject of discussion.

By a course of analogical inductions, we have tried to prove: 1st, That our fellow-men act for an end; 2d, That the animals, when they obey intelligence and feeling, act for an end; 3d, That instinctive actions are directed towards an end; 4th, That the functions themselves, so analogous to the instincts, are equally directed towards an end. What remains to be proved in order to exhaust the series of our inductions is, that not only the *operations* of the organs, but even the *formation* of these organs, again supposes the idea of an end. Now, to achieve this last step, we need only call attention to the identity of function with the creative act of the organism. It may be said of the animal what has been said of the world, that conservation is only continued creation. In effect, what difference is there between the nutritive act whereby the animal continually repairs the waste of its

nature, § 245.—*Encyclopædie des sciences physiques*, p. 350.) It will be noticed, besides, that it is not in order to deny the final cause that Hegel here introduces the vital principle, but in order to place within, and not without the living being, the cause of the finality therein manifested—a question which we do not here discuss. (See below, on *Immanent Finality*, the second chapter of Book ii.)

organs, and the creative act whereby it produces these organs themselves? Between these two acts, and uniting them to each other, is found the phenomenon of regeneration in mutilated organs. Every one knows the fact of the regeneration of nerves, the reproduction of the feet of the salamander, and the still more astonishing reproduction of the half of the body in the *planaria.* What are these phenomena but the development of that repairing force which is manifested in nutrition, which during a part of life is at the same time an extensive force, for the animal grows in proportion as it repairs itself. Now, between the phenomena of regeneration and the phenomena of formation, is there anything but a difference of degree? The force which for the first time produced the foot of the salamander, must have acted in the same manner as the same force when it reproduced that same amputated foot. And, in fine, the nutritive function itself is only this same force of reparation applied to preserve the organ once formed. In fine, if conservation is here only a continued creation, we may say that all the forms which the act of conservation takes in the animal—function, instinct, reflecting industry, science, and art—are only degrees of one and the same force; and consequently, such as it shows itself in its most elevated state, that is, proportioning means to an end, such is it in its origin. Finality is therefore its essence, its true definition.

It is not necessary to pass beyond humanity in order to find all the degrees through which this force passes before arriving at its highest degree, which is voluntary and reflecting finality. In the voluntary act—for instance, the act of an engineer who invents a machine—we have the consciousness both of the end to be reached and of the means which conduct to it; in the act of passion, like that of the soldier who mounts to the assault, we have consciousness of the end without consciousness of the means; in the instinctive act, like that of the child pressing the breast of the nurse, there may be consciousness of the act, that is, pleasure, but there is

consciousness neither of the end nor of the means. In the organic act, like the nutritive act, it is the same; but there is, none the less, co-ordination towards an end: in reproduction the mother works, without knowing what she is doing, at an image like the parents. Thus ascending from function to function, from art to art, we always find ourselves guided by the thread of analogy to the first formation of organized beings, which (in whatever fashion we may imagine it) can only have been, like the actual formation, a certain choice of means adapted to an end.

Thus, then, human industry is not an exceptional phenomenon in nature; it is the last degree of a series of analogous phenomena, which one after another, with a growing and decreasing consciousness, present themselves to us with a character essentially identical, namely, the co-ordination of the present to the future. This character, grasped by our consciousness, attests to us the existence of finality: finality, therefore, co-exists everywhere with it.

A single point is left us to examine to complete the demonstration. Our whole reasoning rests upon analogy. But what is the logical worth of reasoning by analogy? We have not here to examine in an abstract and general manner the theory of analogy. It will suffice us to find in experience a striking and decisive proof of the force of this mode of reasoning. This proof we find in the certitude which the belief in the intelligence of our fellow-men gives us. On the one hand, it is certain that it is by an analogical reasoning that we affirm intelligence in our fellow-men; on the other hand, it is undeniable that this belief equals in certitude any other of our affirmations. Analogy may therefore have a force of proof equal to that which any of our faculties of knowledge can give.

When we pass from ourselves to our fellow-men by way of induction, it is certain that this induction is only an analogical induction, for, however like us other men may be, they yet differ sufficiently to constitute each one a different indi-

viduality; and what renders still more remarkable the incomparable certitude of this induction is, that a single case suffices us to conclude regarding all, *ab uno disce omnes.* We only know ourselves; we therefore only know a single individual, and we conclude without exception regarding all the individuals like us. Thus, before affirming that all the individuals of a species have this or that organization, anatomists dissect a very great number of them; here, on the other hand, we can never directly observe more than a single being, and that alone suffices.[1] This, then, is a conclusion obtained by way of analogy, equal in certitude to our most warranted affirmations. It is even a very remarkable fact that no sceptic to my knowledge has ever explicitly called in question the intelligence of other men. If Descartes could say that there is at least one certain truth,—namely, I think, therefore I exist,—we may likewise say that it is about as certain that other men think and that they exist.

Now, if we ask ourselves why we suppose that other men think, we shall see that it is in virtue of the principle of final causes. In effect, what is it that experience shows us in the actions of other men, but a certain number of phenomena coordinated in a certain manner, and bound not only together, but also to a future phenomenon more or less remote? Thus, when we see a man prepare his food by means of fire, we know that this assemblage of phenomena is connected with the act of taking food; when we see a painter drawing lines on a canvas, we know that these apparently arbitrary acts are

[1] If it be said that this combination is not a reasoning by analogy, but a veritable induction, since we go from the same to the same, I reply that other men are not precisely the same beings as I, and that the distinctive characters of the individuality are so salient in humanity that they constitute truly notable differences: likeness prevails, but it is mixed with many differences. Besides, to conclude from the likeness of apparent qualities to the likeness of hidden qualities is precisely what is called *analogy*. In fine, when we hear a strange tongue spoken, or find characters of unknown writing, we do not the less certainly conclude from them the intelligence of the men who have spoken those languages or traced those characters. Now, here it is evident that the reasoning is analogical, since the data are neither languages nor signs that we know and use ourselves, but only analogous signs.

connected with the execution of a picture; when we see a deaf mute making signs which we do not understand, we believe that these gestures are connected with a final effect, which is to be understood by him to whom he makes them; in fine, when men speak, we see that the articulations of which a phrase is composed are co-ordinated to each other so as to produce a certain final effect, which is to awaken in us a certain thought and sentiment. Now we cannot see such co-ordinations, whether actual or future, without supposing a special cause for them; and as we know by internal experience that with ourselves such co-ordinations only take place under the condition that the final effect is previously represented in our consciousness, we suppose the same thing in the case of other men; in a word, we suppose for them the consciousness of an end, a consciousness reflecting more or less, according as the circumstances more or less resemble those that accompany in ourselves the reflecting consciousness.

Thus, when we affirm the intelligence of other men, we affirm a truth of indisputable certitude; and yet we only affirm it on the ground of analogy, and of analogy guided by the principle of final causes.

When we pass from our personal intelligence to that of other men, it might still be said, strictly speaking, that that is a veritable induction, and not an analogy, the limit between these two processes being besides vague and undecided; but it is not the same when we pass from man to the animals. Here the reasoning is incontestably analogical, and yet it gives results which are still of a sufficient certitude to leave no doubt in practice. It is thus that men are entirely persuaded that there is feeling in animals, and even in a certain measure intelligence; and it is those who know them best who have the firmest conviction on this point. The paradox of Descartes on animal machines has not found acceptance with any philosophical school, and those that reject it most of all are precisely those most opposed to final causes. Now it is only by analogy that we pass from man to the animal;

analogy is therefore capable of giving a very high degree of certainty and of conviction.

But if analogy has guided us hitherto with a degree of exactness which no one disputes, why should it cease to have the same demonstrative force when we pass to kindred phenomena, very like those that have authorized our first inductions—namely, from intelligence to instinct, from instinct to function, from function to the very construction of the living machine? We need not go back upon the series of phenomena we have set forth above. It is enough for us to have shown the certainty of the analogical method in the two first degrees of this descending induction; the same certainty must apply to the cases following.

In a word, if, notwithstanding the divergence of the forms, we are warranted to say that the polyp is an animal as well as man, whatever be the abyss that separates the one from the other, we are not less warranted to say that the crystalline a natural lens, is a work of art, by the same right as the artificial lens made by the optician. Be this art conscious or unconscious, external or internal, it matters little; the same object, identically the same, cannot be here a machine, there a freak of nature. And if we admit, what can hardly be denied, that it is a machine, we admit at the same time that it is a means adapted to an end; we admit the existence of the final cause.

We have tried to reproduce with some exactitude the argument of common sense, which consists in inferring from the industry of man the industry of nature. This argument can be reduced to this well-known principle: the same effects are explained by the same causes; *eorundem effectuum eædem sunt causæ.* Experience shows us in a certain and precise case the existence of a real cause, namely, the final cause; in all similar or analogous cases we infer the same cause, at least so far as the differences noticed between the facts do not warrant us to call in question the existence of such a cause. Now there is not any difference between the facts

noticed which warrants this doubt, for the only two that we have noticed is that human art is on the one hand conscious, and on the other external to its products, while the art of nature is unconscious, and within its products. But this second difference rather implies a superiority than an inferiority; it implies more perfect machines and a more profound art; and as to the first, it would only be an argument against the final cause if we affirmed that the art of nature has not an intelligent cause, which we do not do. It would only, therefore, avail against those who admit an instinctive finality at the origin of things, and not against us, who by no means take in hand to defend this hypothesis, and who have only left it provisionally in suspense by a simple concession, and in order not to complicate the question.

Thus the two differences which exist between human art and the art of nature do not weaken in any way the force of the principle laid down, namely, that the effects are explained by the same causes. The final cause is therefore a real cause, attested by internal experience, and residing objectively in all organized productions, as well as in the works of human art.

CHAPTER IV.

ORGAN AND FUNCTION.

THE whole series of preceding inductions rests on the presumed analogy of the industry of nature and human industry. Is this analogy, justified by theory, justified also by science? This the course of these studies now leads us to examine.

The ancient physiology, following the footsteps of Galen, was chiefly occupied with what was called the *use of parts*, that is, the appropriation of organs to functions. Impressed above all by the admirable agreement manifest between the form of a given organ—for instance, the heart—and its use, it followed this preconceived idea, that in every organ the structure reveals the use, just as in human industry the structure of a machine can *à priori* reveal its destination. In this view, anatomy was the true key of physiology, and the latter was only its handmaid. By means of the scalpel, the true form and structure of organs was discovered, and from thence the uses of these organs were deduced. Sometimes this method led to great discoveries, as happened to Harvey in regard to the circulation of the blood. At other times it led to error. Most frequently men thought they divined what in reality they did nothing but observe. But we may conceive what a considerable part the principle of final causes played in this way of regarding physiology.

If we are to believe the present masters of physiological science, this method, which subordinates physiology to anatomy, which deduces the uses and functions of structure from the organs, and which is consequently more or less inspired by the principle of final causes, is exhausted; it has become barren, and a more philosophic and profounder method has had to be

substituted for it. It is said to be contrary to observation to affirm that the structure of an organ reveals its function. Even did one thoroughly know the structure of the liver, it were impossible to infer the use of it, or at least one of its uses, namely, the secretion of sugar. The structure of the nerves would never show that these organs were destined to transmit either motion or sensation. Besides, the same functions may be exercised by organs the most diverse in structure. Respiration, for instance, is performed in one case by lungs, in another by gills; among certain animals it is effected by the skin; among plants, by the leaves. Reciprocally the same organs serve in different animals to accomplish the most diverse functions. Thus the sound, which in fishes is the true analogue of the lungs of the mammalia, scarcely, if at all, serves for respiration, and is only an organ of support and equilibrium. In fine, in the lowest animals the organs are in no way differentiated. One and the same homogeneous and amorphous structure virtually contains the aptitude to produce all the vital functions—digestion, respiration, reproduction, locomotion, and so on.

From these considerations M. Cl. Bernard[1] concludes that the structure of organs is only a secondary element in physiology, and still more, that the organ itself is again only a secondary object, and that we must go farther, more in advance, penetrate deeper, in order to discover the laws of life. Organ, as well as function, is only a result. Just as bodies in inorganic nature are always more or less composite bodies, which chemistry reduces to simple elements, so the organs of living beings ought to be reduced to their elements; and just as chemistry only became a science when it learned thus to distinguish the simple from the composite, so physiology has only begun to be a science since it has tried to reach the elementary principles of the organs. This revolution was effected by the immortal Bichat. He first conceived the idea of seeking for the elements of the organism, which he calls the

[1] Cl. Bernard, *Les tissus vivants.*

tissues. The tissues are not organs: a single organ may be composed of several tissues; a single tissue may serve for several organs. The tissues are endowed with elementary properties, which are in them inherent, immanent, and specific: it is no more possible to deduce *à priori* the properties of the tissues, than it is possible to deduce those of oxygen; observation and experience can alone discover them. The sole object, accordingly, of philosophical physiology is to determine the elementary properties of the living tissues. It is for descriptive physiology to explain how the tissues are combined in different organs according to the different species of animals, and to infer the functions from those elementary properties of living nature of which they are only the results. Wherever such a tissue occurs, it occurs with such a property: muscular tissue will always be endowed with the property of contractility; nervous tissue will always be endowed with the property of transmitting sensations and motions. However, even the tissues, again, are not the ultimate elements of the organism. Beyond the tissue there is the *cell,* which is the true organic element; and thus the functions of the organs are found to be nothing more than the diverse actions of the cells composing them. Hence it is evident that the form and structure of the organ, however important it may be from the point of view of descriptive physiology, plays merely a secondary part in philosophical or in general physiology.

Another physiologist, M. Ch. Robin,[1] likewise puts forth ideas on this matter analogous to those of M. Cl. Bernard, but he carries them much farther. The former, in fact, beyond the physical explanation, permits the metaphysical explanation to remain, and even more than once calls attention to the necessity of it; the latter absolutely suppresses all metaphysical explanation, and reduces all to the physical. He especially contests the assimilating of the organism to a machine. This was the idea which was formed regarding it in the school of Descartes; such was also the definition given

[1] *Revue des cours scientifiques,* 1re série.

of it by a celebrated English physician, Hunter, who said: The organism is reducible to the idea of the mechanical association of parts.' This theory, according to M. Robin, cannot be maintained in the present state of science. It leads, in fact, to the admission that there can be organism without life. Thus, according to Hunter, a corpse, so long as its elements are not dissociated, would be organized as well as a living body. This is an entirely false view. The organism cannot exist without its essential properties; and it is the combination of these properties in action that is called life. It is, besides, easy to show that mechanical structure is only one of the consequences of the organism, but is not the organism itself. The case of fossils sufficiently proves it, for in fossils, form and structure remain even when the immediate substances which composed them have been destroyed and replaced, molecule by molecule, by fossilization. There remains no trace of the very matter of the animal or plant which once lived, although the structure be mathematically preserved to the smallest details. We touch a being which we believe has lived—which is still organized—and we have only dead matter before our eyes. Not only, according to M. Robin, can structure or mechanical combination subsist without there being any organism, but reciprocally, the organism can exist before there is any mechanical arrangement. He sets up, in fact, a scale which shows us the different degrees of the growing complication of organisms. In the lowest degree are the anatomical elements, above are the tissues, then the organs, then the systems of organs, and, finally, the complete organism. An organism—for instance, an animal of the higher order—is composed of different *systems of organs*, whose acts are called *functions;* these systems are composed of *organs*, which, in virtue of their *conformation*, have this or that *use;* these organs, in their turn, are composed of *tissues*, of which the arrangement is called *nature* or *structure*, and which have *properties;* these tissues are reducible to organic elements, called *cells*, which

are sometimes found with a certain structure, that is, are composed of different parts, such as the body of the cell, the kernel, the nucleus, etc., and take the name of *figurative organic elements;* sometimes they are found without any structure, as an amorphous, homogeneous substance, such as, for instance, the marrow of bones, the grey matter of the brain, and so on.

According to M. Robin, that which essentially characterises the organism is a certain mode of molecular association between the *immediate principles.*[1] Whenever this mode of molecular association exists, the organized substance, with or without structure, homogeneous or amorphous, is endued with the essential properties of life. These properties are five in number,—nutrition, growth, reproduction, contraction, innervation. These five vital or essential properties of the living being are not found in all living beings, but they may be met with in any, independently of every mechanical structure. The study of organs and of their functions is, therefore, only the study of the different combinations of the organic elements and of their properties.

Thus, yet once more, mechanical structure is not an essential element of the organism. If we consider at present the vital properties, and the first of all, nutrition, we will see still more clearly the essential difference existing between the organism and a machine. For in a machine each of the molecules remains fixed and immoveable, molecularly, without evolution; if any change of this kind be manifested, it brings about the destruction of the mechanism. But, on the other hand, this molecular mutation is the very condition of existence of the organism. The mode of molecular association of the immediate principles in the organism permits the incessant renovation of the materials without causing the destruction of the organs; nay, more, what precisely characterises the organism is the idea of evolution, of transformation, and development—ideas which are all incompatible

[1] Chemical compounds, almost exclusively proper to organized beings.

and inconsistent with the conception of a mechanical structure.

If we sum up the general sense of the physiological theories which we have just set forth, and which appear most to correspond with the actual state of science, it will be seen that not only is physiology freeing itself more and more in its methods from the principle of final causes, but also that in its doctrines it is tending to occupy itself less and less with the form and structure of organs, and with their mechanical adaptation to function. These would now only be a sort of literary considerations; science now only sees in organized bodies, in the systems which compose these bodies, in the organs which compose these systems, results and complications of certain simple elements or *cells*, the fundamental properties of which are investigated as chemists study the properties of simple bodies. The physiological problem is therefore no longer, as in the time of Galen, the use or utility of parts, but the mode of action of each element, as well as the physical and chemical conditions which determine that mode of action. According to ancient ideas, the object which the scientist pursued in his researches was the animal, the man, or the plant; now, it is the nerve cell, the motor cell, the glandular cell, each being viewed as endued with a proper, individual, independent life. The animal is no longer a living being—it is an assemblage of living beings; it is a colony: when the animal dies, each element dies one after the other; it is an assemblage of little *egos*, to which some even go so far as to attribute a sort of dim consciousness, analogous to the obscure perceptions of the Leibnitzian monads. Occupying this point of view, it appears that the celebrated comparison of the philosophers between organs and the instruments of human industry was only an old superficial idea, which is of no use in the present state of science, and that finality, so long abandoned in the physical and chemical region, was destined also to become in physiology a secondary and unimportant phenomenon. For if an amorphous sub-

stance is capable of self-nourishment, of self-reproduction, of self-motion,—if, on the other hand, as in the nerves, one cannot discover any possible relation between structure and function, —what remains but to prove that in a given condition a given substance has the property of self-nourishment, in another the property of feeling, just as in chemistry it is proved that oxygen has the property of burning, chloride the property of disinfecting, etc.? In a word, there now only remain causes and effects, and nothing resembling means and ends.

While modern physiology, following the footsteps of Bichat, neglects the structure and use of organs to consider *physiological elements* and their properties, comparative anatomy, following Geoffroy Saint-Hilaire, in like manner turned from the forms of organs to consider especially the *anatomical elements*[1] and their connections. Both seek the simple in the composite. Both seek to determine these simple elements by relations of space and of time, whether by describing their fixed place in the organism, or by describing the consecutive phenomena which are constantly connected with them. We recognise here the rigorous method of modern science, whose endeavour is to disengage itself more and more from every preconceived idea, and which confines itself to proving determinate relations between the facts and their constant conditions.

It does not pertain to philosophy to contest with science its methods and principles; and, besides, it is most true that the object of science is to discover in the complex facts of nature the simple facts that serve to compose it. In every

[1] We must distinguish the *physiological* or even *anatomical elements*, recognised by modern *histology*, from what are called *anatomical elements* in the school of G. St. Hilaire. The first case concerns the ultimate elements of tissues, that is, the *cells*, spheroidal molecules which are in some sort the atoms of the organized being. According to G. St.-Hilaire, occupying the point of view of zoology, the anatomical element is the elementary type of a given organ, as it is fixed by its place in the organism. Be it, for instance, the fourth section of the anterior member, it will become a hand, a paw, a wing, or a fin, according to circumstances, but is itself none of these organs, and is only characterised by its connections. It is, therefore, a purely abstract and ideal element, while the cell is a veritable element, concrete and evident to the senses. See in the appendix, Dissertation III. on *G. St. Hilaire and Final Causes.*

point of view, therefore, we cannot but encourage science in the investigation of the simple elements of the organized machine. But the question at issue is whether, because science is self-interdicted from all investigations other than those that trace effects to their proximate causes, philosophy, and in general the human mind, ought to limit themselves to that research; whether thought must be precluded from investigating the meaning of the spectacle it has before its eyes; and in particular, what the thought is that presided at the composition of organized beings, or at least whether thought really presided thereat. It is easy to show that this inquiry is in no way excluded by the preceding considerations. We have only, in fact, to suppose that the organism is, as we think, a prepared work, arranged with art, and in which the means have been prearranged for ends. Even on this hypothesis it would still be true to say that science ought to penetrate beyond the forms and uses of organs, to investigate the elements of which they are composed, and to endeavour to determine their nature, whether from their anatomical situation or from their chemical composition; and it will be the duty of science to show what are the essential properties inherent in these elements. The investigation of ends does not, then, exclude that of properties, and even supposes it; and the investigation of the mechanical adaptation of organs no more excludes the study of their connections. If there be, as we believe, thought in nature (whether conscious or unconscious, immanent or transcendent thought, matters little at present), that thought could only manifest itself by material means, linked according to relations of space and time; and science would have even then no other object than to show the connection of these material means according to the laws of co-existence or succession. Experiment, even aided by calculation, can do no more, and all that goes beyond is no longer positive science, but philosophy. It is no longer science properly speaking; it is thought and reflection, which are quite different things. Doubtless philosophic thought

mingles always more or less with science, especially in the sphere of organized beings; but science rightly strives to disengage itself more and more from it, and to reduce the problem to relations capable of being determined by experience. It does not follow from this that thought ought to abstain from the investigation of the meaning of the complex things that are before our eyes; and if it find there something analogous to itself, it should not be prohibited from recognising and proclaiming it, because science, in its rigorous and legitimate severity, prohibits itself from such considerations.

Seek, in short, some means to subject to experiment and to calculation (the sole rigorous methods of science) the thought of the universe, in case such a thought presided over it. When intelligence has for its manifestation signs analogous to ours, it can evidence itself by such signs.[1] But a work of art, which by itself is not intelligent, and which is only the work of an intelligence (or of something analogous),—this work of art has no sign, no word to inform us that it is a work of art, and not the simple result of complex blind causes. A man speaks, and thereby we have the means of knowing that he is a man; but an automaton does not speak, and it can only be by analogy, comparison, and inductive interpretation that we can know that this automaton is not a freak of nature. So is it with the works of nature: if they be the works of a foreseeing thought, or, if you please, of a latent and hidden art analogous to instinct, these works of nature have no means of informing us that they are works of art, and it can only be by comparison with our own that we judge them to be so.

Accordingly, thought in the universe, supposing that it manifests itself in some manner, could never be recognised otherwise than in the way in which we claim to reach it, that is, by analogical induction. It can never be an object of

[1] Berkeley goes so far as to maintain in *Alcyphron* that nature is in the proper sense of the word a language of God; our sensations are the signs of the mathematical properties of things to which they have no resemblance. But this is a somewhat mystical conception, which could not be accepted without many modifications and reservations.

experiment and calculation, consequently science can always place it out of account if it please; but, because it may have placed it out of account, and, in place of seeking the rational signification of things, contents itself with showing their physical connection, can it, without an inexplicable illusion, believe that it has scattered and refuted every teleological supposition?

To show, as it does, that these apparent machines are reducible to elements endued with certain properties, is by no means to prove that these machines are not the work of an industry, or of an art directed towards an end. For that industry (blind or not) on any hypothesis can only construct machines by making use of elements whose properties are such that, when combined, they produce the desired effects. Final causes are not miracles; they are not effects without cause. It is, therefore, not astonishing that, in ascending from organs to their elements, one finds the elementary properties whose combination or distribution will produce those complex effects which are called animal functions. The most subtle and learned art, even were it the divine art, will never produce a whole, except by employing elements endued with properties rendering possible that whole. But the problem for the thinker is to explain how these elements can have been co-ordinated and distributed so as to produce that final phenomenon which we call a plant, an animal, a man.

Since we maintain as legitimate the old comparison of human art and the industry of nature, let us show by an example how the physiological theory of the vital elements in no way excludes the hypothesis of finality. Suppose an instrument of music, the use of which we do not know, and which nothing tells us to be the work of human art,—could not one say to those who supposed that it is a machine adapted to serve the musician's art, that that is a superficial and quite popular explanation; that the form and use of the instrument mean little; that analysis, on reducing it to its anatomical elements, sees nothing in it but a collection of

strings, wood, ivory, etc.; that each of these elements has essential and immanent properties; the strings, for instance, have those of vibration, and that in their smallest parts (their cells); the wood has the property of resonance; the keys in motion have the property of striking, and of determining the sound by percussion? What is there wonderful in this, it would be said—that this machine should produce such an effect, for example, as the production of a succession of harmonious sounds, since it is certain that the elements composing it have the properties necessary to produce that effect? As to the combination of these elements, it must be attributed to fortunate circumstances which have brought about this result, so analogous to a preconceived work. Who does not see, on the contrary, that in thus reducing the complex whole to its elements and their essential properties, nothing has been proved against the finality that resides in the instrument, because it really resides in it, and because this finality just requires, in order that the whole may be fit to produce the desired effect, that the elements should have the properties they are seen to have.

Men of science are in general too much inclined to confound the doctrine of the final cause with the hypothesis of a hidden force, acting without physical means as a *Deus ex machinâ*. These two hypotheses, so far from coinciding, formally contradict each other; for he who says *end*, at the same time says *means*—that is, a cause fit to produce such an effect. To discover this cause is in no way to destroy the idea of the end; it is, on the contrary, to display the condition *sine quâ non* of the production of the end.

Final causes do not exclude, on the contrary they require physical causes; reciprocally physical causes do not exclude, but appeal to final causes. Leibnitz has expressed this in terms of remarkable precision. 'It is good,' he says, 'to conciliate those who hope to explain mechanically the formation of the first texture of an animal and of the entire mechanism of the parts, with those who give an account of the same

structure by final causes. Both are good, and the authors who follow these different ways ought not to abuse each other; for I see that those who apply themselves to explain the beauty of the divine anatomy, ridicule those others who believe that a motion of certain liquids which seems fortuitous can have made so beautiful a variety of members, and regard those people as rash and profane. And these, again, regard the former as simple and superstitious, like those ancients who regarded the natural philosophers as impious when they maintained that it is not Jupiter who thunders, but some matter found in the clouds. It would be best to conjoin both considerations.'[1]

Nothing, then, has been proved against final causes, when organic effects have been reduced to their proximate causes and to their determining conditions. It will be said, for instance, that it is not wonderful that the heart contracts, since it is a muscle, and contractility is an essential property of muscles. But is it not evident that if nature wished to make a heart that contracts, it behoved to employ for this a contractile tissue, and would it not be very astonishing were it otherwise? Have we thereby explained the skilful structure of the heart and the skilful mechanism shown in it? Muscular contractility explains the contraction of the heart; but this general property, which is common to all muscles, does not suffice to explain how or why the heart contracts in one way rather than another, why it has taken such a form and not such another. 'The peculiarity presented by the heart,' says M. Cl. Bernard, 'is that the muscular fibres are arranged in it so as to form a sort of bag, within which is found the liquid blood. The contraction of these fibres causes a diminution of the size of this bag, and consequently an expulsion, at least in part, of the liquid it contains. The arrangement of the valves gives to the expelled liquid the suitable direction.' Now the precise question which here occupies the thinker is, how it happens that nature, employing

[1] Leibnitz, *Discours de métaphysique* (Opuscules inédits, 1857), p. 353.

a contractile tissue, has given it the *suitable* structure and arrangement, and how it rendered it fit for the special and capital function of the circulation. The elementary properties of the tissues are the necessary conditions of which nature makes use to solve the problem, but they in no way explain how it has succeeded in solving it. Moreover, M. Cl. Bernard does not decline the inevitable comparison of the organism with the works of human industry, and even often recurs to it, as, for instance, when he says: 'The heart is essentially a living *motor machine*, a *force-pump*, destined to send into all the organs a liquid to nourish them. . . . At all degrees of the animal scale, the heart fulfils this function of *mechanical irrigation*.'[1]

Moreover, we must, with the learned physiologist just quoted, distinguish physiology and zoology. 'For the physiologist, it is not the animal that lives and dies, but only the organic materials that constitute it. Just as an architect, with materials all possessing the same physical properties, can construct buildings very different from each other in their external forms, so also nature, with organic elements possessing identically the same organic properties, has been able to make animals whose organs are prodigiously varied.' In other words, physiology studies the abstract, zoology the concrete; physiology considers the elements of life, and zoology living

[1] No physiologist has more insisted on this comparison than M. Moleschott, one of the chiefs of the new materialism. 'Like the steam engine, the *human machine* only works if there be introduced into it combustibles, which, in burning, produce caloric, a part of which is converted into work. But this work is not executed without resistance, which absorbs a considerable part of it. In this respect the human machine surpasses all mechanisms hitherto produced by industry. In fact, the work of this machine can rise to the fifth of the mechanical equivalent of the caloric produced, while other machines hardly obtain the half of these results.—The human body is constantly in use, but the *retort*, which they call the stomach, dissolves and prepares. . . . It pours them into a very long *tube*. . . . The blood, by means of a *suction* and *force pump*, waters all its *suckers*, its *springs*, its *pistons*, its *wheels*. . . . The combustibles behove to be cut by *scissors*, crushed by *millstones*. . . . To these mechanical processes of division fall to be added the action of eight or ten chemical *re-agents*. . . . A *chimney* is not awanting to the human machine. . . . The circulation of the blood is a problem of *hydraulics*. . . . The nerves serve as *reins* and *spurs*. . . . etc.' (See *Revue scientifique*, 2me partie, t. i. pp. 487, 488.)

beings such as they are realized, with their innumerable and varied forms. Now, who constructs these forms? Do the materials of themselves unite and coagulate to give birth to apparatus so complicated and skilful? Cl. Bernard here again recurs to the old comparison drawn from architecture. 'We may compare,' he says, 'the histological elements to the materials man employs to raise a monument.' In this case we recall, with Fenelon, the fable of Amphion, whose lyre attracted the stones, and brought them together so as to form of themselves the walls of Thebes. Thus it is that in the system of materialism organized atoms unite to form plants and animals. No doubt, in order that a house may exist, the stones composing it must have the property of gravitation; but does this property explain how the stones form a house?

Not only must we distinguish physiology and zoology, but in physiology itself we have still to distinguish, according to the same author, *descriptive* and *general* physiology. General physiology investigates organic elements and their properties; descriptive physiology must just take the organs as they are, that is, as results formed by the union of organic elements. Now these are results which will always call forth the wonder of men, and which have not been explained by a reduction to the elements. No doubt, so long as the anatomical or organic elements are only in the state of elements, we do not perceive in them the secret of the combinations which render them fit to produce this or that effect; and it is perhaps the same as regards the tissues. But when the tissues are transformed into organs, and the organs unite to form living individualities, these combinations are something else than complications. They are veritable constructions; and the more complicated the organism, the more it resembles skilful combinations, the products of art and industry. The problem, therefore, remains quite entire, whatever idea may be formed of the organism, whether it be regarded as a mechanical or as a chemical combination. For in this last case it still remains to inquire how

this chemical combination succeeds in passing from that amorphous state in which it is said to commence, to that complicated and skilfully adapted structure which is seen in all the degrees of the scale of living beings.

We admit that the structure or form of organs does not always reveal their functions. For instance, it has been found possible by exact labour to determine the geometrical form of the nerve-cells, composing as well the sensory as the motor nerves; but there is no relation between the shape of these cells and their functions. What relation, for instance, can there be between the triangular form and sensation, between the quadrangular form and the motive influence? These relations are not even constant; because in birds, for instance, they present an arrangement precisely the reverse: there the motor cells are triangular, and the sensory cells quadrangular. Thus it appears that these forms have really little importance, and that the function of the structure is not to be deduced from them. That is evident; but, on the one hand, the geometric form ought not to be confounded with the mechanical arrangement, and on the other, the structure itself ought to be distinguished from the fact of adaptation.[1] Thus, whatever be the meaning of the shape of the nerve-cells, though it had no relation to a given function, it is still the case that the nerves must be so arranged as to put the centre in communication with the organs, and these with the external medium. This arrangement of convergence and divergence from the parts to the centre, and from the centre to the organs, has an evident relation to sensation and locomotion, which, again, have a not less evident relation to the preservation of the animal. Besides, even when the structure may not have any meaning, the fact of adaptation remains none the less. For example, I do not know whether the structure of the salivary and mammary glands has any relation to the special

[1] In fact, there may be chemical, physical, and dynamical adaptation, as well as mechanical. For instance, the chemical combination which takes place in the lungs, so suited to the support of life, is as much a phenomenon of adaptation and of finality as the structure of the valves of the heart.

secretions produced by these two kinds of organs; but were there nothing of the kind, the fact of the salivary secretion is none the less in a remarkable relation of adaptation and agreement with the nutritive function; and the secretion of milk, which only appears at the moment when it is useful, and by a happy coincidence with the act of parturition, presents no less the most striking adaptation, the most startling agreement with the telic result, which is the preservation of the offspring.

We are far from maintaining that life is nothing but a mechanical aggregate; on the contrary, it is one of our principles that life is superior to mechanism. But without being itself a mechanical combination, it constructs for itself mechanical means of action, so much the more delicate as the difficulties are more numerous and complex. 'Life,' says M. Cl. Bernard, 'resides exclusively in the organic elements of the body: all the rest is only *mechanism.* The organs are only apparatus, constructed *with a view* to the preservation of the elementary properties. . . . These collections of organs, which are called anatomical systems, are indispensable to the play of the organism, but not to life itself. They only represent simple mechanisms of precision, rendered necessary by the complication of the mass of anatomical elements which constitute the life of an organism more or less superior. These systems are useful, but not indispensable to the life of the cells. In fact, cells are known and observed living absolutely in the external medium—for instance, the monocellular animals. . . . But as soon as we pass from a simple cell to a composite organism, we perceive that a nervous system and a circulatory system become necessary; for how else could the elements placed in the interior, far from the external medium, receive impressions from it?'[1]

Thus life creates and distributes into systems the organs of which it has need, in proportion as it becomes complicated. Who could give any name but that of art and industry

[1] Cl. Bernard, *Revue des cours scientifiques*, 13 février 1875.

to this interior work of living nature? And what else is this work itself than a progressive adaptation? The last word, then, is always the same, and that word is finality.

Thus it signifies little to our point of view, it does not even matter to it in any way, that the organism is essentially, and by definition, a mechanical combination. It is enough for us to know that in most cases, and in proportion as it becomes perfect, the organized substance creates for itself mechanical agents in order to realize its functions. No doubt the organized substance of which the eye, the heart, or the wing is composed is not in itself a mechanical body; but it is capable, by a virtuality which is in it, of forming for itself instruments of action in which the utmost mechanical skill is manifested; and this suffices for the philosophical doctrine of finality.

It is not at random that the organized substance passes from that homogeneous, amorphous, indeterminate first state, which appears to be its beginning, to that state of skilful complication in which it is seen in the superior animals. It is according to a law, the law of the progressive perfecting of functions at the rate of the progressive differentiation of the organs. This is the law which M. Milne-Edwards has ingeniously called the *law of the division of labour*,[1] and to the high importance of which, in the development of animals, he has rightly drawn attention; but in the very expression of this happy formula, who does not see how difficult it is for science to avoid this comparison of human labour and the labour of nature, so evident is it that those two sorts of labour are only degrees of one and the same thing? In the first instance, in humanity, as in the living organism, all the wants, all the functions, are in some sort confounded; the diversity of functions commences with the diversity of organs and of wants: the first division of labour is that which nature has instituted. But in proportion as the wants mul-

[1] *Introduction de zoologie générale* (chap. iii.). See also *Dictionnaire classique d'histoire naturelle* (1827), art. 'Organization des animaux.'

tiply, the actions and functions of individuals separate, and the means of performing these actions with more convenience and utility for man multiply in their turn; human industry, therefore, is nothing else than the prolongation and development of the labour of nature. Thus nature makes prehensile organs, the arms and the hands: industry lengthens them by means of stones, sticks, bags, pails, and of all tools for felling, digging, picking, trenching, etc. Nature creates organs for the mechanical trituration of food: industry prolongs them by its instruments, which serve to cut, to tear, and dissolve that food beforehand, by fire, water, and all sorts of salts; and thus the culinary art becomes, as it were, the succedaneum of the art of digestion. Nature gives us organs of motion which are themselves mechanical marvels compared with the rudimentary organs of molluscs and zoophytes; human industry prolongs and multiplies these means of locomotion by means of the different motor machines, and of animals employed as machines. Nature gives us protective organs; we add to them by means of the skins of animals, and by all the machines which serve to prepare them. Nature, in fine, gives us organs of sense: human industry adds to them by innumerable instruments constructed after the same principles as the organs themselves, and which are the means both of remedying the failure and infirmities of our organs, of increasing their range, and of perfecting their use.

It appears that the comparison that has always been made between the industry of nature and human industry is not at all superficial and metaphorical. This comparison is founded on the certain fact, demonstrated by science, that human industry is only the prolongation, the continuation, of the industry of nature, man doing intelligently[1] what nature has done till then by instinct. Reciprocally, one can therefore say that nature, in passing from the rudimentary state in which all

[1] Here again we must make a distinction: the first arts were only discovered empirically, and the first inventions, without being absolutely instinctive, are not the result of wise reflection; it is only pretty late that inventions become scientific.

organized matter at first appears, to the highest degree of the division of physiological labour, has proceeded exactly like human art, inventing means more and more complicated in proportion as new difficulties presented themselves for solution. Take a gas—for instance, steam—endued with an elastic property; to utilize this property for the performance of any labour—this is the problem of the steam-engine. Or let it be a liquid, called blood, and endued with a certain nutritive and reparative property; to utilize this property by finding means to put this liquid in communication with the organs—such is the problem of the circulatory system. In both cases, nature and art begin with the most simple means; in both cases, nature and art rise to the most skilful, profound, and thoughtful combinations.

To sum up. The doctrine of physiological *mechanism* or *determinism*, taken in however strict a sense (and science could not take it too strictly), does not exclude, and even requires the hypothesis of thought and art as having superintended the development of living nature. The learned physiologist, M. Cl. Bernard, whose ideas we have just been discussing, far from rejecting these conclusions, himself admits them, and expresses them with still more authority than we could have done, when he recognises a *directive and organizing idea*,[1] which rules and controls what he calls 'the morphological evolution' of the animal; when he admits a *vital design*,[2] which serves as type and plan for the formation and development of the organized being; when he distinguishes the material conditions that are the object of science, from the veritable causes, entirely intellectual, which belong to metaphysics: a profound distinction, which the author, without perhaps knowing it, rediscovers after Plato,[3] and which is the knot of the problem of final causes.

[1] Cl. Bernard, *Introduction à la médicine expérimentale*, p. 162.

[2] *Revue des Deux Mondes*, 1875.

[3] '*The cause* is one thing; *that without which* the cause would be no cause is another'—ἄλλο μὲν τί ἐστι τὸ αἴτιον, ἄλλο δ' ἐκεῖνο ἄνευ οὗ τὸ αἴτιον οὐκ ἄν εἴη αἴτιος. (Plato, *Phædo*, ed. H. Etienne, 99.)

But this theory of an organic idea, even taking from it the government of particular phenomena, and only leaving it the direction of the whole, has still appeared to M. Ch. Robin too metaphysical an idea; and this savant has endeavoured to push the mechanical explanation to its last consequences. From the views above expounded on the organism, M. Robin has thought he could derive a theory of the adaptation of organs to functions[1] which would absolutely exclude all idea of plan, induction, and art, and leave nothing remaining but the principle of the *conditions of existence.*[2] Adaptation, according to him, is only one of those general phenomena of organized matter which one may call, with Blainville, *result-phenomena.* Of this sort are, for instance, vegetable or animal calorification, heredity, the conservation of species, etc. These phenomena are not the acts of a determinate and particular apparatus; they are results which sum up the aggregate of the phenomena of living matter, and which depend on the totality of the conditions of the organized being. According to M. Robin, physiology has become able exactly to determine the conditions of this adaptation, which has thereby become a positive fact; and every hypothesis regarding the finality of the organs is absolutely useless.

He first discards a doctrine which he calls 'Aristotelian,' which is that of the contemporary German physiology of Burdach and of Müller, and which M. Cl. Bernard would not repudiate—namely, that the egg or the germ is the organism potentially.[3] This doctrine does not perceptibly differ, according to M. Robin, from that of the *preformation* of organs, or *encascment of germs,* developed in the 18th century by

[1] *De l'appropriation des organes aux fonctions.*

[2] The Positivist school substitutes for the principle of *final causes* that of the *conditions of existence:* no being can subsist without the conditions that renders it possible; given these conditions, it will be; in their absence, it will not be. Nothing simpler; but who is it that causes such conditions to be given?

[3] 'The germ is the whole *in potentiâ;* when it develops, the integral parts appear *in actu.* In observing the egg in hatching, we see appear before our eyes that centralization of parts emanating from a potential whole.' (Müller, *Manuel de physiol.*, trad. franç. t. i. prolég. p. 20.)

Bonnet, and which was already to be found in Leibnitz and Malebranche. According to these philosophers, the germ already contained the entire animal in miniature, and the development could only be growth and enlargement. But to say that the egg is the animal potentially, is it not almost saying the same thing in another form? And how could it be virtually the entire animal, if it did not already contain a certain preformation of it? But experience appears absolutely contrary to all these hypotheses. The germ, seen by the most powerful microscope, presents no appearance of a formed organism; rather, in the first stage of their evolution, all germs are identical, and there is no difference between that of man and that of the animals placed lowest in the zoological scale. In fine, on the hypothesis of preformation, or the potential organism, all the organs ought to appear at the same time, while experience shows us the organs forming piece by piece by external addition, and coming into being one after the other. Such is the doctrine of *epigenesis*, adopted at present by embryology, and which has effectually banished that of preformation. If this be so, it is not the *whole* that precedes the parts, but the parts that precede the whole: the whole, or the organism, is not a cause, it is only an effect. What becomes of the hypothesis of Kant, Cuvier, Müller, and Burdach, who all agree in supposing that in the organism the elements are commanded, conditioned, determined by the whole? What becomes of the *creative, directive idea* of M. Cl. Bernard? This hypothesis is again refuted by the fact that the deviations of the germ, whence monstrosities, deformities, and congenital maladies are produced, are almost as numerous as the normal formations; and according to the energetic expression of M. Ch. Robin, 'the germ oscillates between life and death.' In fine, monstrosities themselves are vital productions, which originate, develop, and live quite as well as normal beings; so that if final causes be admitted, it must be admitted 'that the germ potentially contains as strictly the monster as the most perfect being.'

These are powerful considerations, but are not decisive. To be able to say, in effect, that a house is a work of art, it is in no way necessary that the first stone, the foundation-stone, be itself a house in miniature, that the edifice be preformed in the first of its parts. No more is it necessary that that stone potentially contain the whole house—that is, that it be inhabited by a sort of invisible architect, who, from this first *point d'appui*, should direct all the rest. One may therefore renounce the theory of preformation without at the same time renouncing finality. Rather it appears that the doctrine of preformation would be still more favourable to the exclusion of finality. For, given an organism in miniature, I could easily comprehend that the growth and enlargement should take place by purely mechanical laws. But what I do not comprehend is that a juxtaposition or addition of parts, which only represents external relations between the elements, should be found, little by little, to have produced a work which I would call a work of art if a Vaucauson had made it, but which is much more complicated and delicate than one of Vaucauson's automata. No doubt, even on the hypothesis of preformation, it would still be necessary to explain the type contained in the germ; but for the same reason, it is needful to be able to explain the type realized by the entire organism; and whether the animal be preformed or not, the problem still remains the same. In the hypothesis of preformation, the type appears formed all at once; in that of epigenesis, it is formed piece by piece. But from a work of art being formed piece by piece, which depends on the law of time,—the law of all temporal and perishable things,—it in no way follows that it is not a work of art; and gradual evolution does not less require a directing and creative idea than the sudden hatching of the whole, supposing that such a hatching were possible. Thus, to be permitted to say with M. Cl. Bernard that a directing and creative idea governs the organism, with Müller and Kant that the whole commands and conditions the parts, it is not necessary that that idea be

designed beforehand to the bodily eyes in the primitive nucleus of the future being. From my not seeing beforehand the plan of the house, it does not follow that there is none. In a picture done by a painter, the first lineaments or touches do not contain the whole picture, and are not its preformation; and yet here it is no doubt the idea of the whole that determines the appearance of these first parts. So, too, the idea may be immanent in the entire organism without being exclusively present in the egg or the germ, as if the initial point of the organism must have been in this respect more privileged than the other parts of the living being.

As to the difficulty caused by deviations of the germ, it would only be decisive against finality if the organism were presented as an absolute whole, without any relation to the rest of the universe,—as an empire within an empire, the *imperium in imperio* of Spinoza. Only in this case could it be denied that the actions and reactions of the medium have brought about deviations in the whole. The organism is only a relative whole. What proves it is that it is not self-sufficient, and that it is necessarily bound to an external medium; consequently the modifications of this medium cannot but act upon it; and if they can act in the course of growth, there is no reason why they should not likewise act when it is still in the state of germ. There result, then, primordial deviations, while the alterations taking place later are only secondary; and if monstrosities continue to develop as well as normal beings, it is because the laws of organized matter continue their action when turned aside from their end, as a stone thrown, and meeting an obstacle, changes its direction and yet pursues its course in virtue of its acquired velocity.

The true problem for the thinker is not that there are monsters, but that there are living beings; just as what astonishes me is not that there are madmen, but that all men are not born mad, the work of constructing a thinking brain being abandoned to matter which does not think. They would not live, it will be said, were they born mad. I will

also say: How is it that there are men, and men who think? The germ oscillates, we are told, between life and death. Let it oscillate as much as it will, still it becomes fixed, since the species last; and from oscillation to oscillation nature has come to create the human machine, which, in its turn, creates so many other machines. Can the groping of a blind nature, whatever it may do, go so far? Even in humanity, groping only succeeds in producing definite effects, and in profiting by happy chances, on condition of being guided. It is thus, for example, that empiricism, not science, has in preceding ages discovered the most of our industrial processes. That is a succession of happy chances if you please, and not an art reflected on and systematically conducted; but at least it needed some one to remark these happy chances and to reproduce them at will. It is stated that one of the most curious improvements of the steam-engine is due to the thoughtlessness of a young child, who, wishing to go to play, invented I know not what combination of pack-thread, which was afterwards made use of. This was no doubt an accident: be it so; yet it is evident that it needed an intelligence to invent this artifice, and it needed one also to notice and to imitate it. Throw at random into a crucible all the elements of which a machine is composed, and let them oscillate indefinitely 'between monstrosities and death,' that is to say, between useless forms and chaos, they will oscillate thus to eternity without ever assuming any precise form, and without even producing the appearance of a machine.

M. Robin attempts from his point of view the explanation of the phenomenon, and appeals to the following facts: the subdivision and individualization of the anatomical elements engendered by each other, and their configuration, whence is derived the situation they occupy beside each other; the evolution to which they are subjected, no organ being at first what it will be later, hence the successive appearance of cells, tissues, organs, collections of organs, and systems; the primordial consubstantiality of all the vital properties, which, being

immanent in all organized matter, are found again in all the metamorphoses of that matter; the molecular renovation by way of nutrition, and the action of the internal or external medium, whence by inevitable destiny results an accommodation with that double medium; in fine, the contiguity and continuity of the living tissues, whence originates the marvellous consensus which is remarked in the normal organism. Such are the principal causes that explain, according to M. Robin, the adaptation of organs to functions,—causes, for the rest, which we have gathered here and there from his work, for he invokes sometimes the one, sometimes the other, without conducting them in a systematic and regular manner.[1]

All these causes may be reduced to two principal: on the one hand, the individualization or specification of the anatomic elements, with distribution forcibly determined by their structure, which explains the diversity of the organs and thereby the diversity of the functions; on the other hand, the contiguity of the living tissues, whence originates the consensus or harmony of the living being in general. The other causes are there to increase the number; some explain nothing, others are only the very thing to be explained. Indeed, the molecular or nutritive renovation only serves for preserving the organs, but does not explain their formation and adaptation; as the action of the medium, internal or external, only serves to limit and circumscribe the organic possibilities, and in no way gives account of the determinate combinations. As to

[1] An analogous explanation seems to have been given by Heckel, the chief representative of transformism in Germany: 'The processes by which these three layers of cells give birth to the most complicated organs reduce themselves in all to—1st, Segmentations, that is, the augmentation of the number of cells; 2d, The division of labour, or the differentiation of these cells; 3d, The combination of these cells differently developed. . . . All the final adaptations ought to be considered as the natural and necessary consequence of co-operation, of the differentiation and perfecting of the cells.' (*Heckel et la doct. de l'évolution en Allemagne*, par Léon Dumont, p. 71.) These words signify at bottom that adaptation is explained by adaptation. For if all these operations are done by causes purely physical, to which the existence and preservation of living beings are absolutely indifferent, how is it that differentiation causes co-operation? Why should not the cells oppose each other, and by the conflict of their attributes render life impossible?

the evolution of the organs, which are never at first 'what they will be later,' as to the successive appearance of the elements, tissues, organs, collections of organs and systems, this is the very thing that has to be explained. We know well that the organism in developing proceeds from the simple to the compound, but how that compound, in place of becoming a chaos, is distributed into regular, co-ordinated, and adapted systems, is precisely what we want to know. In fine, the consubstantiality and the immanence of vital properties (supposing that these words present a clear sense to the mind) would explain, if you will, that all the organs are endued with life, and all virtually possess these properties, but not how they are divided and combined into special organs. There remain, then, I repeat, the two causes we have mentioned.

If, meanwhile, we seek philosophically to give account to ourselves of the nature of these two causes, we shall see that they amount to saying that the succession explains the adaptation, and the contiguity the harmony. Ever to substitute relations of space and time for intelligible and harmonious relations is the character of positive science, for these are the sole conditions that can be determined by experiment and calculation. That is a very legitimate work, but becomes a usurpation when it pretends so to limit the range of human thought. It is in the nature of the human mind, endued with sensibility, only to conceive things by representing them to itself by symbols of space and time. These are the material conditions of thought; but the question is, whether thought is not quite another thing, and whether its proper object is not precisely what is not represented by space and time.

Thus the learned anatomist, whose ideas we are analyzing, shows us the anatomical elements originating one from the other with such a particular configuration, and, as they originate, grouping in a certain way by reason of their structure. From such a structure there must proceed, he says, a succession of determinate acts. Now it is very true that the formation of

an organ cannot be comprehended without the successive appearance of special elements formed after a certain fashion; but definite does not mean adapted, and the question still remains, why these adapted acts are those which exist, and not others—why, for instance, the glands secrete liquids useful to the economy, and not poisons. The difficulty is not solved by saying that if these acts were not quite compatible with life, the animal would not live. For there is nothing contradictory in the animal not living, that is, in its entire non-existence; the strange thing just is that it exists. The history of embryological evolution, then, however interesting, in no way destroys the inductions we have made from the profound analogies of human art and vital art; for on both sides there are special elements, formed in a definite manner, and rendering possible the production of such and such acts. In human art some one makes his choice between possibilities. Why, then, in the vital art should the material substratum be freed from the necessity of choice, and spontaneously find the useful combination which is demanded by the interest of the whole? In human works the material conditions are recognised as impotent to co-ordinate themselves in relation to a precise effect; why should the material conditions in the organism be endued with so marvellous a privilege? To say that, given the elements, it is a thing of course that they form into tissues, and that, given the tissues, it is a thing of course that they form into organs, is to say that, given silk threads, they will arrange themselves into pieces of silk stuff, and that when one has a piece of cloth, it is as if one had a coat. Now, although cloth is fit to form a coat, and the threads of the silkworm to form silk stuff, this fitness for a determinate act is not equivalent to the production of the act, and something more is needed. In human industry this motive cause is in us; in the industry of nature we do not see it, but it is as necessary in this case as in the other.

I will say as much of the explanation which consists in accounting for the vital *consensus* by the contiguity of the

organic parts: this is still to reduce an intellectual relation to one external and material. To say that the harmony of the living body is explained because the parts touch, is to say that a coat is whole because it has no holes. The fit of the coat to the body, and the correspondence of the parts, have no relation to the continuity of the piece of stuff, for that continuity existed in the piece before it was made into a garment. Continuity can explain, if you will, the sympathy of the organs and the communication of impressions, but not the correspondence and co-operation. In fine, contiguity again could, in strictness, account for the adaptation of neighbouring parts,—for instance, the articulation of the bones,—but not for the common action of remote parts both at the same and at different times.

To sum up. There is no contradiction between our principles and the most recent scientific conceptions. No fact, no law of nature, warrants us to eliminate the final cause from the human mind. Science, so far as it is science, is mute on this problem. It remains to inquire whether the facts will not admit of another interpretation than that which we have given.

CHAPTER V.

MECHANISM AND FINALITY.

THE animal kingdom is like a tourney-ground, where there come to fight, on the one side the physicists, accustomed to explain all by efficient causes, and on the other the psychologists, accustomed to explain phenomena by the final cause. The latter, starting from man, are chiefly struck with the analogies which the industry of nature presents to human industry. The former, starting from matter, are struck with the analogies which the properties of living matter present to the properties of matter in general. On the one side, it is sought to explain life by psychological views; on the other, by physical and mechanical considerations.[1] We have followed the thread of analogies by starting from one of these two principles. It is only just now to attempt the opposite method, in order to weigh fairly the advantage of both.

One of the most striking examples of the purely physical explanation of a marvellous concord of phenomena is the example already cited of the cosmogonic hypothesis of Laplace. If the problem presented be considered, it appears that we cannot explain by any physical cause so many coincidences presented by the solar system: 1st, The coincidence of forty-three motions all in one direction; 2d, The similar arrange-

[1] With Kant, I mean by *mechanism* the chain of phenomena and their connection, according to the law of cause and effect, without any intervention of final causes. In this sense mechanism is opposed both to liberty and to finality. In another sense, mechanism, far from being opposed to finality, on the contrary would necessarily imply it; for to say mechanism, is to say art, trade, industry, and, consequently, intelligent foresight. In the text we confine ourselves to mean by mechanism the explanation of all phenomena by the laws of motion, these laws being themselves considered as essential properties of matter.

ment of all the stars in the same plane; 3d, The central position of the sun, whence there incessantly proceed to all the stars that surround it rays of heat and light. Yet all these coincidences, all these wonderful agreements, are explained without difficulty on the hypothesis of a primitive nebula rotating in whatever direction, and progressively transformed. Now the existence of rotating nebulæ is matter of experience. The existence of nebulæ with nuclei variously condensed is equally matter of observation. Besides, experience proves that a rotating fluid mass gives birth to a central nucleus surrounded by a ring, an arrangement like that presented by Saturn at present. In fine, the theory teaches us that this ring behoves to break and give birth to secondary stars, always involved in the motion of the central star. Thus nothing is more probable, nothing more rational, than this hypothesis, into which there enters no consideration of finality.

Will it be said that here the facts to be explained present, it is true, a remarkable concord and co-ordination of phenomena, a system, but that that system does not present the essential character to which we have reduced finality, namely, agreement with a future determinate phenomenon? Advantage could not be taken even of this means of escape; for all this evolution ends in a final phenomenon of high importance, namely, the central position of the sun, which is the condition of life in the various planets. Now it could be and has been maintained, that this central position of a warm and luminous star was the best possible for the whole system. 'It would require more astronomical knowledge than I can here display,' says the judicious Paley, 'to explain in detail what would be the effects of a system in which the central body should be opaque and cold, while one of the planets was luminous and warm. I believe, however, it will easily be perceived—1st, That, taking for granted the necessary proportion in the respective masses of the bodies in repose and those in motion, the burning planet would not suffice to light and heat all the

system; 2d, That the heat and light would be imparted to the other planets in a much less regular manner than they are by the sun.'[1] Thus, according to Paley, the central position of the sun is the best possible as regards the distribution of heat and light. It may be said, then, that the planetary system is co-ordinated in relation to this best possible distribution, and there would be room to apply even here the criterion we have given of finality. And yet we have just seen that this remarkable concord and arrangement of phenomena is explained mechanically in the most simple way. Why should not this mode of explanation, which here finds so happy an application, equally apply to the combinations, no doubt more complex, but not essentially different, which organized beings present?

The phenomena of crystallization, again, are phenomena in which there are manifested a systematic, indisputable order and arrangement, without it seeming necessary to invoke any finality. No doubt chemistry has only as yet hypotheses to explain those different geometric forms that the different bodies take in crystallizing; but these hypotheses, whatever they be, only appeal to the properties of matter subject to geometric laws. No one will say that the molecules of the different bodies come together mutually with the view of forming prisms, cones, and pyramids; and yet they take such forms. Why might it not be said that, in virtue of like properties, the living molecules are co-ordinated according to the type of the vertebrata, the articulata, or the radiata? What difference is there, indeed, between the zoological and the chemical types, except that the former are more complicated? And if it be admitted that the molecules, in virtue of causes unknown to us, may have taken this or that form, why might it not be admitted that they may have fallen upon forms more or less like those that human art gives to its inventions,—here the form of a bag, there of a pump; here of forceps, there of a millstone; elsewhere that of a canal, a sucker or lens, an ear-trumpet, cords, levers, etc.? These innumerable forms might

[1] Paley, *Natural Theology*, chap. xviii.

only be the result of the arrangement of the molecules after certain laws; but such forms once produced in living matter, what wonder that they should act conformably to their structure? What wonder that the bones, being hard, should support the body; that the muscles, endued with the property of contracting, should be capable of putting the bones in motion; that the courses of the veins and arteries being hollow, the blood should be able to flow in them; that the heart, being a muscle, should be possessed of an impelling power; that the teeth, being broad, pointed, or sharp, should be apt to grind, tear, or cut; that claws, being curved, should be fit for plunging into an animal's flesh; that the eye, being composed of humours of different densities, should refract the light, and make its rays converge towards a central point; that sonorous cords should be apt to vibrate; that the male and female organs, having hit upon forms at once analogous and opposite, should be fit to answer each other; and so of all the organs?

In a word, the adaptation of organs to functions is a metaphor; there is no adaptation, but simply manifestation of properties inherent in the organ itself. Given a living substance, it is natural it should act, and should act according to its structure. Function is nothing else than the organ acting. What wonder that it should be apt to produce it? As well wonder that the concave surface should be so marvellously adapted to the convex; as if the concave and the convex were not the same thing considered from two different points of view. So of organ and function; they are two points of view of one and the same thing—living matter. It is at once active and organized, and its activity is evidently modified by its organization; such organ, such action; if the organ be modified, the action is equally modified. Be the organ, for instance, the fourth section of the anterior member, in man it will be a prehensile agent; in the horse, an agent of support; in the bird, an agent of flight; in the fish, an agent of natation, etc. Thus the form determines the action, but nothing warrants you to affirm that the action predetermines the form.

For why should there necessarily be in nature beings called to fly, swim, or creep? And as to the organic forms whose action would either be injurious or useless to the animal, they would either probably bring about their destruction,— and no wonder if we do not meet with such,—or else they would disappear in default of use, in virtue of that well-established law that organs are developed by exercise and atrophied by inaction.

Thus function is only a result of the organ when once formed. Meanwhile it remains to explain the formation of the organ. But if the planetary system, which shows us the regular arrangement of a multitude of stars all revolving in the same direction according to an elliptic curve, and nearly in the same plane, around a central star; if the different systems of chemical crystallization, which enable us to witness varied groupings of molecules according to geometrical laws,— if these different systems can be explained by the sole principle of the properties of matter, without in any way bringing in the idea of the end, why should it not be the same with organic systems, which only differ from the preceding in the complication of their forms and the marvellous variety of their structures? But who can measure the productive fecundity of nature? More or less complexity in its works does not, then, imply the necessary intervention of a new cause which had hitherto been dispensed with.

Thus, leaving entirely aside the question of the nature of life, and without at all prejudging the question of the existence or non-existence of a vital agent, it may be said that the finality of living beings is a pure appearance, and is reducible to the general laws of mechanism, that is, to the chain of phenomena according to laws. In other words, the series of phenomena is unilateral. There is only a descending series, that which proceeds from causes to effects, from antecedents to consequents. There is no inverse series, that which proceeds from means to ends, and which, therefore, places the cause in the effect, and determines the antecedent by the consequent. This

inversion, already mentioned by Aristotle, then by Lucretius, then by Spinoza, then by G. St. Hilaire, and by the modern naturalists, which changes the effect into the cause and the cause into effect, is contrary to the scientific method, and is in no way justified nor necessitated by the facts, however seemingly marvellous, of the animal or vegetable kingdom. Analogies are relied on in order to discover designs and ends in living nature, but other analogies may serve to explain these wonderful facts without design and without an end. Causes no more than beings ought to be multiplied without necessity. What need is there to recur to the final cause when one can be satisfied by the efficient?

Thus, while on the one hand, by a continued declension, we have been able to descend from analogy to analogy, from the express foresight manifested in human intelligence to an unconscious foresight manifested in the living organism, reciprocally, in ascending by a continued complication from the most simple geometric to the most skilful organic forms, it has been possible to explain, by a coincidence of mechanical causes, the same phenomena which we have referred to the final cause.

Let the problem be well understood. On the one hand, the final cause is incontestably manifested in the psychological sphere; the question is whether it is manifested lower down. On the other hand, the mechanical cause is evidently manifested, and reigns alone (at least as far as appears) in the inorganic sphere; the question is whether this kind of cause suffices higher up.

Between the psychological and the inorganic domains extends the domain of the living organism—that is, yet once more, the tourney-ground of the two causalities, the two modes of explanation. Can all that is below and outside the subjective and psychological domain admit of teleological explanations? Reciprocally, can all that is above geometric forms and laws be explained by mechanism alone?

Let us admit, with the previous hypothesis, that mechanism

suffices to explain the production of organs—that is, let us consider the functions as the results of the organs, and the formation of the organs as the result of the laws of living nature, modified by external causes. Let us suppose, in a word, that there is no end, either general or partial, in the organism. If this mode of explanation is sufficient, it should be able to mount higher. Now, we must not forget that we have shown the continuous and gradual analogy which exists between the formation of the organs and function in general, between function and instinct, between instinct and intelligence, between animal intelligence and human intelligence; in fine, between the intelligence of other men and that of each one of us. In virtue of this series of analogies, the same kind of causes explaining the formation of organs ought to be able to explain all the other subsequent phenomena, up to and including human intelligence. If this analogical reasoning be disputed with us, let us not forget that mechanism itself has no other mode of reasoning; for between crystallization and organization there is only, after all, a remote analogy.

We shall say, then, and we ought to say, that instinct has no end any more than any other function,—that instinctive industry, quite as well as organic industry, is only a chain of phenomena, issuing from each other by way of consequence, without any of them having ever been foreseen either by the animal or by the cause, whatever it be, that has formed the animal. We shall say that instinct, as well as all the other functions, is a simple result of organization, and that the organization itself which has produced this or that instinct is only the effect of the meeting of certain causes and of the unconscious reaction of physical agents. And, in fact, if it can be admitted that agents not directed, not co-ordinated, can have met, in obedience to physical and chemical laws, in a way so fortunate as to produce the circulatory system of the vertebrate animals, why should it not be admitted that a similar meeting, or a succession of fortunate coincidences, may have produced certain automatic combinations from whence

might result the instinctive actions that astonish us? For it is not more difficult for a blind nature to produce organs resulting in the act of weaving or building, than to construct those resulting in the act of flying, swimming, or running, or those, in fine, resulting in the act of breathing or digesting.

Thus all, even unconscious finality, will have to be excluded by hypothesis from instinct as well as from every other organic function. Let us well understand ourselves. The question here is of an absolute exclusion, and not an apparent exclusion, as too often happens. Often, in fact, after having nominally excluded final causes, one resumes them without perceiving it, by attributing to living nature a spontaneous property of accommodation and adaptation, which is nothing else than finality itself under another name. For to say that it is a law of organized matter spontaneously to find the best combination for its preservation and growth, is precisely to attribute to it an essential innate instinct, which implies an obscure foresight of the end, and an unconscious yet precise choice of the means. That that is an incomprehensible hypothesis I do not deny. It is the hypothesis of those who, whether expressly or by implication, preserve finality, while suppressing every intelligent cause. But, incomprehensible or not, this hypothesis preserves and recognises the only thing that we have to defend at present, namely, the existence of ends in nature. Yet once more, it is necessary that men understand themselves. The hypothesis of pure mechanism, if it knows what it means to say, excludes every species of finality, and that quite as well in the explanation of instincts as in that of functions. Men must needs be ready to say that an unknown physical cause has produced this happy combination, whence results the bee's art or the bird's song.

But if men hope to elude the difficulty in explaining instinct by habit, hereditary or not, a hypothesis we will meet again elsewhere, they lay themselves open to this question: Is habit itself anything else than an instinct? Habit, in

fact, is a faculty proper to organized nature; it is not met with in inorganic beings. 'In vain one throws a stone,' says Aristotle; 'it does not assume the habit of remaining suspended.' If, in fine, habit in its turn admits of being mechanically explained, we return precisely to what we said, namely, that there may be such a fortunate mechanical cause as, whether immediately or by degrees, and by a series of favourable modifications, produces at last what so resembles an art or industry as to be mistaken for it, but which is only in reality a purely automatic combination.

If, however, such an automatic combination may suffice to explain the instinctive actions of animals, why should it not suffice to explain the actions of their intellect or passions? And what right should we have to suppose, by analogy with ourselves, that the animals are endued with intellect and passion? If the analogy we have mentioned between the industry of nature in the construction of living organs, and human industry in the construction of inert machines, be contested, why should the very remote analogy subsisting between animal and human actions be appealed to? There is decidedly more difference between the supposed intelligence of a dog and that of Newton, than there is between a lens and the crystalline, a camera obscura and the eye, a pump and the heart in vertebrates. For here, if there is a difference from the point of view of art, it is in favour of the living machine, and yet men will not see any art in it; and, on the contrary, when a dog barks, they will have this barking to be the analogue of the articulate voice, and to correspond, like the latter, with some internal sense; as if nature, in those happy freaks which are constantly invoked, could not have created by chance a barking machine—a surprising toy, as Descartes regarded it, having only a very superficial resemblance to a sentient and intelligent creature.

In order to combat the Cartesian automatism, the actions of animals are instanced, so like, it is said, to those of man, and the intelligence of the animals is inferred. But this is

to see only one side of things. The intelligent actions of animals very remotely resemble those of man, but they much more resemble the instinctive actions of these animals themselves; and nothing is more difficult than to separate exactly these two domains—that of intelligence and that of instinct. Now we have seen that the operations of instinct themselves differ in nothing essential from the functional operations of the living machine, and, in particular, from that essential operation of the living being which consists in the construction of its organs. If, then, a simple agency of physical causes, without any foresight, express or implicit, can explain how living nature succeeds in accomplishing the series of delicate and complicated operations which terminate in the structure of an organ, why should not the same mechanical agencies produce a freak, no doubt more complicated, but not essentially different—that of an animal that has the air of feeling, thinking, and willing, without possessing any of these faculties? And if one is warranted to urge against the hypothesis of Descartes, that that would be a very strange freak on the part of a creator sovereignly wise, who would seem to wish to amuse himself thus at our expense, this is not an objection against a blind nature that knows not what it is doing, and that can by chance produce toys quite as well as volcanoes and rocks. And if, protesting against this materialistic automatism, a vital agent is invoked,—vital properties, and I know not what besides, more or less vital,—I reply that men don't know what they say, or they ought to understand that what would precisely distinguish any vital from every inert agent would just be to be fit to co-ordinate organic materials after a plan, which would be to relapse into the very hypothesis which it is wished to set aside.

I say, then, that mechanism cannot urge any serious objection against the automatism of the beasts; but the same mechanism ought to go much farther still, and ought not to recoil even from the automatism of men—I mean *automatism* in the strict sense, namely, a mechanism purely material,

without intelligence, passion, or will. If the animal is only a machine, why should other men be anything for us but machines? And here the question is not about the *man-machine* of Lamettrie, which thinks and feels like us, but about a man-machine which, like Vaucauson's automaton, could neither think nor feel in any way. After all, what proof have we that other men are intelligent like ourselves? None positively exact. For we only know ourselves immediately—we have never directly discovered intelligence in other men. It is only, then, by induction, and without any direct experience, that we assume in other men a mind and an intelligence as well as in ourselves. There is, no doubt, a wonderful resemblance between other men and ourselves; but there is also a wonderful resemblance between the industry of nature and human industry. Now, if a combination of causes can have produced, without any art, what so closely resembles art, why could it not have produced, equally without any intelligence, what would as closely resemble intelligence? The hypothesis is not so absurd, since there really are cases in which men act automatically and unconsciously, as if they really were intelligent—for instance, cases of somnambulism or of *dementia*. The theory of reflex actions also shows us that the same things may be done at one time under the influence of the will, at another under the influence of purely mechanical actions. Consequently it is not absurd to generalize the hypothesis; and one cannot see why the theory of happy chances should stop half-way. On this theory, accident—that is, the product of all the favourable chances—has been quite able to produce an organ suited for singing; why should it not produce an organ fitted for speech? And why could not this organ be modified by exercise and imitation, like that of the parrot? Why should it not become fitted to vary the production of sounds? Why should not this reproduction of sounds, determined by external circumstances, come to imitate certain intelligent combinations? as, for instance, it is the case that one can teach

an idiot in certain circumstances a phrase whose meaning he does not understand. Multiply the happy circumstances, and the chances of combination, and see whether it is impossible to refer to chance the formation of an organism resembling ours so as to be taken for it, manifesting entirely similar action, but which would only be a fiction—an automaton in which not a single phenomenon could be discovered having an end, and which would consequently be destitute of all intelligence. Let a point be fixed where, theoretically, the hypothesis of pure automatism would become strictly impossible.[1] No doubt such a hypothesis shocks common sense, but they protest against the competency of common sense in these matters—the right is refused it of interfering in natural philosophy; the analogies are found ridiculous which common sense has always recognised between human art and the art of nature. And yet let the attempt be made to find in support of the intelligence of our fellow-men other reasons than those of common sense. It is agreed that there comes a moment when the combinations become so complicated that it is impossible, without too shocking absurdity, not to suppose a co-ordination towards an end. How many combinations, then, of this kind are needed to make such an induction valid?

If, on the other hand, appealing to the extreme resemblance of man to man, the right be assumed to conclude from one's own intelligence to intelligence in other men, and from human intelligence to the intelligence of the animals, let them tell us at what precise moment this argument, drawn from

[1] We can find authority for this apparently extreme hypothesis in the testimony of Leibnitz (*Réplique aux reflexions de Bayle*: *Opera philosophica*, pp. 183, 184, ed. Erdmann): 'There is no doubt that a man could make a machine capable of walking for some time through a town, and of correctly turning at the corners of certain streets. . . . There is only a more or less, which signify nothing in the region of possibilities. . . . Those who show the Cartesians that their way of proving that the brutes are automata would justify him who should say that all other men except himself are simple automata also, have justly and precisely said what I mean.' Descartes has foreseen the objection in the *Discours de la méthode* (part v.); but his answer precisely proves that there is only a difference of less or more.

analogy, will become ineffectual and impotent. If I have the right to suppose that the animal pursues an end when it combines the means of self-preservation and of self-defence, why might I not suppose, with the same right, that living nature has also pursued an end, when, as wise as the animal, she has prepared for it the organs which are for it the fittest to attain that end?

I add that, even were this striking analogy disputed, and all finality in living nature denied, not much progress would thus be made from the moment the existence of intelligent beings had been granted,—and one is indeed forced to admit at least one, namely, myself,—for each one, as Descartes has said, only knows that he exists because he knows that he thinks. Now, doubtless, the intelligent being, at least, is capable of acting for ends, of setting an end before him, consequently of self-determination by the final cause. The question is this, How, in a nature without an end, does there appear all at once a being capable of pursuing an end? This capacity, it is said, is the product of his organization. But how should an organization, which by hypothesis would only be a result of physical causes happily introduced, give birth to a product such that the being thus formed could divine, foresee, calculate, prepare means for ends? To this point the series of phenomena has only followed the descending course, that which goes from cause to effect; all that is produced is produced by the past, without being in any way determined, modified, or regulated by the necessities of the future. All at once, in this mechanical series, is produced a being that changes all, that transports into the future the cause of the present—that is capable, for instance, having beforehand the idea of a town, to collect stones conformably to mechanical laws, yet so that at a given moment they may form a town. He is able to dig the earth, so as to guide the course of rivers; to replace forests by crops of grain; to bend iron to his use—in a word, to regulate the evolution of natural phenomena in such a way that the series of these phenomena may

be dominated by a future predetermined phenomenon. This is indeed, it must be confessed, a final cause. Well, then, can it be conceived that the agent thus endowed with the power of co-ordinating nature for ends, is himself a simple result that nature has realized, without proposing to itself an end? Is it not a sort of miracle to admit into the mechanical series of phenomena a link which suddenly should have the power to reverse, in some sort, the order of the series, and which, being itself only a consequent resulting from an infinite number of antecedents, should henceforth impose on the series this new and unforeseen law, which makes of the consequent the law and rule of the antecedent?

Here is the place to say, with Bossuet: 'One cannot comprehend, in this whole that does not understand, this part that does, *for intelligence cannot originate from a brute and insensate thing*.'[1]

I do not know whether the mechanical philosophy has ever taken account of the difficulty of this problem. It finds it quite natural that the brain thinks, for experience shows it thought everywhere associated with a brain. But leaving aside the speculative question whether matter can think (a problem which does not belong to our subject), is it not evident that for a brain to think, it behoves to be organized in the wisest manner, and that the more complicated this organization, the more probable is it that the result of the combinations of matter will be disordered and consequently unfit for thought?

Thought, in whatever manner explained, is an order, a system, a regular and harmonious combination; it is a system all the elements of which behove to be co-ordinated in order to form a whole. Without this co-ordination the accumulation of ideas or sensations forms no thought. Wherever there is not a subject and an attribute; wherever the conclusions are not contained in the premises; wherever the induction is not founded on similar well observed facts; wherever the fore-

[1] *Connaissance de Dieu et de soi-même*, chap. iv.

sight of the future is not connected with a solid experience of the past, there is only the shadow of thought, but thought itself is absent. This is what occurs in madness, dreaming, delirium, and all similar states. Thus, even by admitting the brain as *substratum* of thought, the difficulty of the problem has not been diminished; for the question always is, how blind matter, without plan and without end, can have co-ordinated its diverse parts so as to form an organ so delicate that the least disorder suffices to interrupt its functions. If matter, submissive alone to physical laws, had formed the organ of thought, it seems that madness ought to have been the rule, and reason the exception; for what a miracle it is that all these sentient and vibrating cells, of which the cerebral organ is said to be composed, should so accord with each other and with the external world that the result of all these movements is a thought agreeing with itself and with the external world?

The old argument upon the chance throw of the twenty-four letters of the alphabet, which never could have produced the *Iliad*, is considered frivolous and popular,[1] but it cannot be dissembled that this hypothesis is strictly that which dogmatic materialists ought to accept and defend. In fact, the *Iliad* is nothing else than a particular act of the human intellect, which has accomplished thousands of others not less astonishing, were it only the discovery of the system of the world and its laws. Thus art, science, industry, all human works, are only, in short, the applications of intellect. That these innumerable applications might become possible, it has been necessary that millions of living and sentient cells, only obeying, like printers' types, physical and chemical laws, without any relation or resemblance to what we call intellect, should be assembled in such an order that not only the *Iliad*, but all the miracles of the human intellect should become possible. For if these cells, in their blind dance, had taken

[1] On the worth of this argument see farther on, Book II. chap. i., and Charpentier, *Mémoire sur la logique du probable* ('Comptes-rendus de l'Acad. des Sc. Morales, avril-mai 1875').

some other direction, some other motion,—if, in place of moving in unison, their rhythm had occurred alternately, if the least derangement had taken place in their situations or respective reactions,—not reason, but madness, as experience shows, would have been the result; for it is known that the least blow given to the equilibrium of the brain suffices to undo its springs and arrest its play.

We know nothing, absolutely nothing, of the cerebral mechanism which presides over the development of thought, nor of the play of that mechanism. But what we know for certain is that that mechanism must be extremely complicated, or, at least, that if it is simple, it can only be a wise simplicity, the result of profound art. Whether this very art be the act of an intelligence similar to that, the mystery of which we are investigating, we will not now inquire here. All that we wish to establish is, that without a predestination (whatever be its cause); without a sort of foresight, instinctive or reflective, immanent or transcendent; without a certain hidden cause (which we purposely leave undetermined for the present), but of which it is the essential character to be induced to act by the effect to be attained, and not merely by predetermining causes,—without such a cause, in a word, the structure of the brain, of which it can be said, as Bacon said of the hand, that it is the *instrument of instruments*, would be absolutely incomprehensible.

It is impossible to dissemble the blunt intervention of chance in this evolution of natural phenomena, which, hitherto governed by the blind laws of physics and of chemistry, the laws of gravity, of electricity, of affinities,—which are all, or appear to be, reducible to the laws of motion,—is suddenly co-ordinated into thoughts, reasonings, poems, systems, inventions, and scientific discoveries. If the elements of things be conceived as mobile atoms, moving in all possible directions, and ending by lighting on such a happy combination as results in a planetary globe, a solar system, or an organized body, it will have to be said as well that it is in virtue of a happy

combination that the atoms have ended by taking the form of a human brain, which, by the mere fact of that combination, becomes fit for thought. Now what is this but to say that letters thrown haphazard might form the *Iliad* in their successive throws, since the *Iliad* itself is only one of the phenomena produced by the thinking activity? But the human mind, whether in the arts or in the sciences, has produced, and will produce, similar phenomena without end. It would not then be a single verse, a single poem, it would be all thought, with all its poems and all its inventions, which would be the result of a happy throw.

If, in order to escape this brute divinity of chance, and the extravagant consequences of blind mechanism, *vital* or *chemical activity*, the *forces* of nature, the *laws* of nature were appealed to, this would simply be to grant, under a vague and unconscious, that is, unphilosophical form, precisely what we ask. For either these activities, forces, and laws are nothing but brute mechanism, or they are distinct from it. In the first case, nothing has been done but to cover with equivocal words the pure doctrine of chance which we oppose. In the second case, these causes, whatever they be, whatever be their essence, are only to be clearly distinguished from brute mechanism by a sort of blind instinct like an art, which makes them find at once and without hesitation the combination best fitted to produce a given effect. If something of this kind be not thrown into the scale to aid the action of the natural forces, if there be not attributed to them, as has been said, a *tendency*, an internal *spring*, the same abyss will always present itself, namely, blind forces, which, combining under the control of blind laws, give birth to intelligent action; as if, for instance, madmen and idiots, brought into contact and excited or calmed by this rencounter, should be found suddenly to produce by their very meeting a harmonious and reasonable whole. And yet within those madmen and idiots there is a secret reason, which contact or sympathy might conceivably awaken for a moment; but among chemical molecules there is, by

hypothesis, no hidden reason. And this would be yet once more a true miracle, and a miracle without an author, that thought should suddenly originate from what is not thought.

In order to diminish the horror of such a prodigy, it will be supposed that the molecules of which organized beings are composed are perhaps themselves endued with a dull sensibility, and are capable, as Leibnitz believed, of certain obscure perceptions, of which the sensibility of living beings is only the growth and development. I shall answer that this hypothesis, besides being entirely gratuitous and conjectural, after all grants more than we ask; for, sensation being only the first degree of thought, to say that all things are endued with sensation is to say that all is, to a certain extent, endued with thought. 'All is full of God,' said Thales. All nature becomes living and sensible. Neither sensation nor thought is any longer the result of mechanism. Sensation being inseparable from desire, desire itself implying a certain vague consciousness of its end, a certain tendency towards an end is thus attributed even to the elements of matter, and a certain perception of the means which lead to it. In a word, the hypothesis of an original and innate sensibility, inherent in matter, is nothing else than the hypothesis of finality itself. And still, in this hypothesis, the rencounter and combination of these sentient molecules would need to be explained, the resulting harmony, the agreement of these various sensibilities; for it is not enough that two instruments be sonorous in order to produce a concert: left to themselves, and tried by an inexperienced hand, they will never yield anything but a discord.

To sum up. It follows from the preceding discussion, that the mechanical hypothesis fully carried out leads—1st, To the violation of all the laws of analogical reasoning, by forcing us even to call in question the existence of intelligence in other men; 2d, To a violation of all the laws of science, by forcing us to acknowledge an absolute hiatus between all the phenomena of nature and the intelligence of man; 3d, To a con-

tradiction, because it is forcibly arrested in presence of a last case, the human intelligence, and consequently it is constrained, at least in this case, to recognise finality, which should suffice for the demonstration. Such are the disadvantages of the mechanical hypothesis when it would rise above purely physical phenomena.

Let us now see whether the teleological hypothesis would have the same disadvantages if it should desire to redescend beneath its natural limit.

We have said that the battlefield of the two theories is the domain of the organism. All that is above, that is to say, the world of intelligence, belongs of right to teleology; whatever is beneath, namely, the world of brute matter, naturally belongs, so far as appears, to mechanism; the middle space is the object of debate. This middle space apart, let us ask what is the position of each hypothesis when, clearing this contested territory, they endeavour to invade their respective domains.

Below organic phenomena, explanation by final cause ceases perhaps to be necessary, that is, to be required by the habitudes of the mind; but, on the other hand, it is never absurd, never contrary to the laws of reasoning, logical or analogical. I am not, perhaps, obliged to explain the motions of the stars by the final cause, but there is nothing irrational in doing so; for, although order does not perhaps always imply finality, it is also true that it never excludes it.

On the other hand, whatever department of the universe we contemplate, it may be said that the mechanical explanation is always necessary, in this sense, that the chain of efficient causes is never broken (the problem of liberty apart); even in the intelligence, there are always causes and effects. On the other hand, if this hypothesis is always necessary, it is insufficient beyond its own limits; and this insufficiency goes the length of absurdity when it pretends to reign alone, to the exclusion of the rival hypothesis, in the domain proper to the latter.

Here, then, is a hypothesis which remains necessary at all stages, but which beyond a certain limit becomes absurd when it is exclusive; on the other hand we have a hypothesis which below a certain limit is not perhaps necessary, but which is never absurd.

If, now, you consider that the first excludes the second, while the second does not exclude the first, it is evident that the second will have a very great advantage.

Thus while it is truly absurd to say that other men are without intelligence,—a strict consequence of pure mechanism,—it is, on the other hand, in no way absurd to say that the physical and inorganic world has been subjected to the laws which govern it *in order to* render possible the presence of life, and life itself *in order to* render possible the presence of humanity, and, in fine, to conceive the whole universe as a vast system subject to a plan.

Let us take up, then, from this point of view, the physical and mechanical sphere, which we have hitherto left outside the range of our studies.

The reason why final causes will always be sought by preference in the sphere of living beings is, that there alone a fact is met with which may be considered as having a veritable *interest*, and which may consequently be an *end*—namely, sensibility. There only, where the possession, the preservation of being is felt, can existence be considered as a good, and consequently as an end to which a system of means is subordinated. What does it really matter to a crystal to be or not to be? What does it matter to it whether it have eight angles in place of twelve, or be organized geometrically rather than in any other way? Existence having no value for it, why should nature have taken means to secure it? Why should it have been at the expense of a plan and a system of combinations to produce a result without value for any one, at least in the absence of living beings? So, again, however beautiful the sidereal and planetary order may be, what matters this beauty, this order, to

the stars themselves that know nothing of it? And if you say that this fair order was constructed to be admired by men, or that God might therein contemplate His glory, it is evident that an end can only be given to these objects by going out of themselves, by passing them by, and rising above their proper system. No doubt it is the same as regards living beings, if one would rise to the absolute end, the final and last end; but in themselves and for themselves they have already a sufficient though relative end, namely, to exist and to feel it: this is for them a good, and one can understand that nature has taken precautions to assure it to them. It is not the same with inorganic beings.

But if inorganic beings have not an end in themselves, it is not at all improbable that they may have one outside of them. 'Why do bodies exist?' said Ampère. 'In order to furnish thoughts to minds.'[1] The Indian philosophers expressed the same thought in a charming and original form: 'Nature,' said they, 'resembles a dancer who only asks to be seen, and who disappears immediately after the applause.'[2] In fine, living beings are bodies, and these bodies need other bodies in order to subsist. Mechanical and physical nature, which has not its end in itself, may therefore be made dependent on living nature as an end. We are thus brought to the notion of *external* or *relative* finality, too much sacrificed by Kant to *internal* finality.[3]

It is strange that it did not strike Kant from this point of view that internal finality is in reality inseparable from external, and cannot be understood without it. The organized being, in fact, is not self-sufficient, and it only exists by means of the medium in which it lives. Nature, then, would

[1] *Philosophie d'Ampère*, Paris, 1866, p. 184.

[2] B. St. Hilaire, *Mémoires sur la Sankhya*, *Mémoires de l'Académie des Sc. Morales et Polit.* t. viii. p. 332. See Appendix, Dissertation V.

[3] *External* or *relative* finality is the utility of a thing for another thing; *internal* finality is the respective and reciprocal utility of the various parts of one and the same being for each other, and of all for the whole being. It is in this sense that in the organized being all is at once 'end and means.'

have done an absurd thing, if, in preparing an organism, it had not, at the same time, prepared besides the means necessary for that organism to subsist. Kant characterises internal finality by saying that a production of organized nature is at once the cause and effect of itself; but it cannot be its own cause by itself, it must assimilate external objects which are proper for this purpose. It is not strictly true to say, as Cuvier does, that the organized being is 'a closed system.' If it were so, nothing would enter, nothing would come out; but that is not life, it is death, for death takes place precisely at the moment when all exchange between the interior and the exterior ceases.

If these considerations are just, how could internal finality be maintained, without admitting at the same time an external finality which is its counterpart? How could it be said that nature has made the herbivora to eat grass, without admitting that the same nature has made the grass to be eaten by the herbivora? Cuvier has said: 'Wherever there are spiders, there are flies: wherever there are swallows, there are insects.' A nature that should make herbivora without having made grass would be an absurd nature. But nature has not committed this absurdity. Having made herbivora, it has made grass; having made eyes, it has made light; ears, it has made sound. If one of these objects has been made to enjoy the other, why might it not be said that the other has been made, at least in part, to serve or refresh the first? It is only the difference of the active and passive. In place of saying: the lamb has been made *in order to be eaten* by the wolf, it will be said: the wolf has been made *in order to eat* the lamb. No doubt, as regards the lamb, to be eaten is, according to the scholastic expression, an *external denomination;* it is not for it a necessary part of its essence; it can accomplish its destiny without that: it is, then, as regards it, only an accident, and it is in this sense that external finality is only relative. But this accident, in so far as it forms part of the internal finality of another being, becomes in its turn an end of nature; and

it may be said that it is one of the views that it has had in creating the lamb. It is the same with the use of external things for human industry. No doubt, strictly speaking, it will not be said that stones have been made in order to build houses, wood to make furniture, and the cork-tree corks. But it will be very correct to say inversely that man, being an industrious animal, *animal instrumentificum*, endued with intelligence, and furnished with a hand, this industrious aptitude has been given to him in order to turn to his use the things of nature; whence it follows reciprocally that the things of nature have been made in order to be turned to his use. And it is certain that the industrial aptitude of man would be a contradiction and an absurdity, if nothing outside had been prepared in order to be utilized by him; and to say, in fine, that this is a pure rencounter, would now be not merely to sacrifice external to internal finality, it would be to return to the theory of chance, which absolutely suppresses every final cause.

To sum up. External finality is the counterpart of internal, and the one is as necessary as the other. No doubt, external finality, just because it is external, is not written, like the other, on the object itself; and in considering an object of nature, one can hardly discover in it *à priori* what end it can subserve. It is in this sense that it may be rash, as Descartes says, to seek to sound the intentions of Providence. But physical and mechanical things being in a general manner connected with finality by their relation to living beings, we conceive that there may thus be in the inorganic world a general interest of order and stability, conditions of security for the living being.

It is true, the hypothesis which connects external with internal finality, and the inorganic with the living world, seems in check in presence of this difficulty, that life has not always existed, at least on our globe, and that the number of ages during which inorganic matter has been prepared for life has considerably surpassed, according to all appearance, the number of ages in which life can have been

produced and preserved. If living beings have been the only real end of creation, why have they not been created at the very first, and why has not the earth from the very first moment been found fit to receive them? Besides, it seems clear that life in its turn is not indestructible. We see in the universe a globe—the moon, for instance—in which life appears to have ceased to exist, if it has ever had a place there. To say that the whole universe has been created that life might appear for a moment on the humblest of its globes, this is a very great disproportion between means and end. The prologue and epilogue of the drama appear very long in relation to the drama itself. Besides, even among living beings, at least the half, namely the vegetable kingdom, appears as insensible as the mineral; and if it enjoys life it is without knowing it. In fine, the dull and diffused sensibility of the lower animals is hardly worth more than absolute insensibility. What matters it to the oyster whether it exist or not?

It is absolutely impossible for us to know what is the proportion in the universe of living and sentient matter to matter not living and not sentient; it is not by the extent of space or time that the value of things ought to be measured. Pascal has rightly said: 'We depend on thought, not on space and duration.' But if life exists throughout the whole universe, which is not at all impossible, it matters little that there are vast amounts of time or space that are deprived of it. It is no more astonishing that there are no animals in the moon, than among the ices of the North or in the deserts of Africa. These vast spaces may be magazines, stores of material which shall serve afterwards to sustain the great movement of circulation necessary to life in the universe.[1] The world may have need of a skeleton of dead

[1] We need to be very reserved in the supposition of final causes in the case of the inorganic world, but we need not systematically discard any of them. 'Just as the force of the sun,' says an eminent savant, M. Grove, 'after having been exercised very long ago, is now rendered to us by the carbon formed under the influence of that luminary, and of that heat, so the rays of the sun, vainly

matter, as the vertebrates have need of a scaffold to support the tissues. It is absolutely impossible for us to specify anything regarding the relations of the two orders; it is enough for us to show their necessary connection, which affords us a glimpse of this, that the one, being the base of the other, may thus possess by communication and anticipation a finality which it would not have in itself.

There is set before us at the present day, as a necessary consequence of the mechanical theory of heat, the prospect of a final state in which, all the motion of the universe being converted into heat, things would fall into an absolute and eternal equilibrium, which would render all life impossible. The illustrious Clausins has called this constant transformation of motion into heat, *entropy*, and has formulated this law in these terms: 'The entropy of the universe tends towards a maximum state; the more the universe approaches this boundary state, the more do the occasions of new changes disappear; and if this state were at last attained, no further change would take place, and the universe would come to be in a state of persistent death.' But this hypothesis has been disputed by one of the very authors of the mechanical theory of heat, by Mayer.[1] Such remote consequences of a theory so new and so delicate may legitimately be called in question. Newton believed that the data of his system of the world necessarily led to the admission that the equilibrium of the world would be deranged, and that it would need the hand of the Creator to re-establish it; but it has since been proved that he was mistaken, and that the laws of the

lost to-day in the sandy deserts of Africa, will one day serve, by means of chemistry and mechanics, to lighten and warm the habitations of the coldest regions.' (*Revue des cours scientifiques* 1re série, t. iii. p. 689.) 'From the mouths of those volcanoes whose convulsions so often agitate the crust of the globe, incessantly escapes the chief nourishment of plants, carbonic acid; from the atmosphere inflamed by lightning, and even from the bosom of the tempest, that other nourishment descends on the earth which is as indispensable to plants, that from which comes almost all their azote, the nitrate of ammonia, which the rains of the storm contain.' (Dumas et Boussingault, *Essai de statique chimique*, 1844.)

[1] *Revue des cours scientifiques*, 1re série, t. v. p. 159.

planetary system are themselves sufficient to guarantee its stability. Thus the greatest scientists may be mistaken regarding the consequences of their own discoveries. Besides, if a state of things like what is foretold us should come to pass, it would warrant us to say that nature, having nothing more to do, had only to vanish entirely, like the Indian dancer; and as some scientists think at present that science necessarily leads to the idea of a beginning,[1] perhaps they will also find that it leads to the idea of an end. But this is to push inductions and hypotheses very far, and perhaps far beyond what we are permitted to conjecture. Let us be content to consider the world such as it is.

We have just seen that from its relation to the organic world, the physical and mechanical world may be considered as having a relative finality, which suffices to explain its existence. Besides, this relative finality once admitted, there will be found in this world, considered in itself, examples of internal finality less striking than in the organic world, but which have also their significance. This is a vague finality, the pathway to finality.

This is the place to recall to mind that we have above established a primary law, which we had provisionally distinguished from the law of finality, and which we have called the *law of mechanical agreement*.[2] We have granted, as a provisional hypothesis, that a simple agreement or internal accord of phenomena, without visible relation to an ulterior phenomenon, did not *à priori* appear irreconcilable with a mechanical cause. But if it be considered more closely, it will appear that this was to concede far too much.

We said that the constancy of the coincidences must have a special cause; but may it be a physical cause? We must now examine this more closely. We have here to make a new distinction. These coincidences may be of two sorts,

[1] *Revue des cours scientifiques*, t. vii. p. 124; Maxwell, *Rapports des sc. phys. et des sc. mathém* (*Revue Scient.* 2e série, t. i. p. 236). See also Caro, *Le matérialisme et la science*, note B, p. 287.

[2] See above, chap. i. p. 54.

namely: 1st, The simple *repetition*, or the great number of the phenomena; 2d, The *concordance* properly so-called between *divergent* phenomena. Now the first case presents nothing incompatible with the physical cause, but that is far from being so evident as regards the second. For instance, the frequency of storms in a given season or country certainly demands a special explanation, but nothing lying outside the domain of physical causes, for the number or the repetition is not beyond the powers of a physical agent. On the other hand, a convergence, a common direction given to elements by hypothesis independent, can only be attributed to a physical cause by supposing in this cause an internal law, which determines in a certain way the motion and direction of the elements—in other words, by attributing to matter an instinct of order and combination, which is precisely what we call the law of finality. If we do not suppose something like this, there only remains the fortuitous concourse of the elements, and consequently the absence of cause. Setting out from this principle, let us see if an exclusively mechanical explanation can be given of all that is presented to us under the form of system and plan—in a word, under a regular and co-ordinated form. Let us consider the two most striking examples of this kind of explanation, namely, the explanation of the form of crystals in crystallization, and the cosmogonic hypothesis of Laplace.

The production of the crystalline forms of minerals is explained by an agglomeration of molecules, of which each one has precisely the same geometric form as the whole. Thus, a tetrahedron will be composed of little tetrahedra, a dodecahedron of little dodecahedra. Very well; the last perceptible appearance which these bodies present is sufficiently explained by that. But it is clear that, as regards philosophy, the problem is not solved. For one thing, in effect, it must be admitted that the integral molecules, directed by a vague geometry, know of themselves how to find the mode of juxtaposition which permits them in uniting to reproduce the figure of the

elements; for pyramids, joined by their bases or their summits, or by their angles, do not make pyramids. What is the physical law in virtue of which such a junction takes place? Must it not be supposed that whatever force produces these forms has in itself some reason or motive which determines it to avoid all the irregular forms, and to confine itself to that one alone which will form a regular geometric figure? In the second place, in explaining the geometric form of the mineral by the superposition or juxtaposition of molecules of the same form, the only thing done is to throw back the question; for whence comes the figure of the integral molecules themselves? Will it be explained by the form of the elementary atoms, or by their mode of distribution in space? But why should the atoms have regular geometric forms? If every rational idea be excluded in order to keep to the conception of mere matter, there is no reason why the elementary particles should have one form rather than another, and the number of irregular forms behoved greatly to exceed that of the regular or geometric forms. As to their mode of distribution, there were no reason why it should be rather this than that, and consequently no reason that any order whatever could proceed from it. The consequence is the same, if, in place of admitting atoms, geometric points, centres of force, or even divisibility without end be admitted; in any case, the geometric form will not be a primitive fact, and will always have to be resolved into an anterior *processus* of component particles, implying a sort of preference or choice for such a form rather than another.[1] Chance cannot here be appealed to, for such constancy cannot be fortuitous. There is needed, then, a reason to direct the motion towards this form; in some sort, it needs to pre-exist before existing. Here we again come

[1] 'Corpus eamdem figuram habet cum spatio quod implet. Sed restat dubium cur tantum potius et tale spatium impleat quam aliud, et ita cur, exempli causâ, sit potius tripedale quam bipedale, et cur quadratum potius quam rotundum. Hujus rei ratio ex corporum naturâ reddi non possit; eadem enim materia ad quamcumque figuram indeterminata est.' (Leibnitz, *Opera Philosophica*, ed. Erdmann, 'Confessio contra Atheistas,' pp. 41-46.)

upon what we have drawn attention to in the living being, namely, the determination of the parts by the whole, and of the present by the future. The only difference is that the crystal seeks this form without having any interest in it; but it is possible that that matters to other beings than itself, and that the precise and regular form of each substance is a condition of order and stability indispensable to the general security.

We could, then, carry still farther than we have done this descending scale, which, starting from the fact of human industry, had brought us step by step to the organizing force. We discover some traces of the same principle even in the *architecture of the atoms*, as it has been called,—an inferior art to that shown in the vegetables and animals, but still an art, for it is not the necessary result of mechanical laws.

It is a very widespread error to believe that wherever we meet with geometry, the final cause must be absent, under the pretext that there is a contradiction between geometry, which is the domain of inflexible fate, and finality, which is that of contingency and liberty. But what is absolutely necessary in geometry is simply the notion of space and the laws of logic; all the rest proceeds from the freedom of the mind. Space in itself is void and naked; it contains potentially all forms, but none actually; no line crosses it, no point sets bounds to it, no figure, no solid of itself delineates itself in it. It is the mind alone which creates geometric figures, whether by deriving them from itself or by borrowing their elements from experience. It is it that, by the motion of a point, engenders the line, whether straight or curved; by that of the line, surfaces; by that of surfaces, solids: it is it that engenders all the figures of different species, and which consequently constructs, by a sort of architecture, all the geometric world. No doubt, such figures being given, logic will have it that such consequences are necessarily derived from them; but it is in no way necessary that the figures be given.

If, then, we see in nature regular geometric forms, we ought not to think that these forms necessarily result from the nature of extension, which is of itself indifferent to all forms. Among all the figures, infinite in number, regular or irregular, which things could have taken, there is needed a precise reason to explain the formation of the regular figures. At the very most, it might have been imagined that by friction, during an immensity of time, all angular forms would have disappeared, and all elementary bodies been reduced to the rounded form; but it is found that this is precisely the only form excluded by chemical combinations, and that nature only rises to the rounded form in living beings by a sort of geometry superior to that of the inert bodies. On the other hand, all the crystalline forms are angular, without ceasing to be regular. No natural selection can give a reason for this singular fact. We must admit a geometric nature as well as an artistic, an industrious nature, and thus we find again in nature all the modes of the intellectual activity of man. As M. Cl. Bernard admits in the organized being a *vital design*, so there is in some sort a *crystallic design*, a mineral architecture, a *directive idea* of chemical evolution. The physical element as such contains absolutely nothing to explain this faculty of obeying a plan.

Let us meanwhile pass from the small to the great, and from the architecture of the molecule to the architecture of the world; let us see whether the hypothesis of Laplace excludes finality or renders it useless.

The solar world forms a system of which the sun is the centre, and around which revolve in the same direction a certain number of planets, and of which some have satellites which equally revolve in the same direction. Now it is found, as we have seen above, that this is precisely the most favourable arrangement for the existence of life, at least on the earth; as to the other planets, their habitability no longer appears to form a question. But setting aside the utility of such an arrangement, there still remain agreement, order,

symmetry, and plan. Now it is this accord and plan that Laplace explains in an entirely physical manner by the nebular hypothesis. This explanation appears to be nearly the reverse of that which is given of crystallization: in this case the form of the whole is explained as an addition or composition of homogeneous parts; in the former, on the contrary, the form of the world was explained as the result of a division or dismemberment of a homogeneous whole. It is, in fact, the dismemberment or division of the nebula which has given birth to the different stars, at present separated, which are only in reality its debris. The primitive nebula was, then, already the actual world potentially; it was the confused germ, which, by the internal labour of the elements, was to become a system. But let it be well observed, the nebula is not a chaos; it is a definite form, whence there is to issue later, in virtue of the laws of motion, an ordered world. The question, as above, is only thrown back; for it recurs when we inquire how matter can have found precisely the form which behoved to lead afterwards to the system of the world? How can actions and reactions purely external, and without any relation to any plan whatever, even with the help of an endless friction, have resulted in a plan? How should order have issued from disorder? The nebula is order already; it is already separated by an abyss from mere chaos. Now there is no need to deceive oneself, the absolute negation of finality is the doctrine of chaos. If you do not admit anything that guides and directs phenomena, you at the same time admit that they are absolutely undetermined, that is to say, disordered: now how are you to pass from this absolute disorder to any order whatever? And where is there found a trace of this primitive chaos? 'It is not enough,' says a philosopher who is at the same time a savant, M. Cournot, 'to establish the possibility of the passage from one regular state to another; it would be necessary to lay hold of the first trace of the passage from the chaotic to the regular state, before insolently daring to banish God from

the explanation of the physical world as a useless hypothesis.'[1]

No doubt the system of the world manifests a certain number of accidents which cannot in any manner be explained by the final cause, and which we need not seek to trace to it. 'Why is Saturn provided with a ring, while the other planets have none? Why has the same planet seven moons, Jupiter four, and the earth only one, while Mars and Venus have none at all? These are as much accidents as cosmical facts.'[2] But we will afterwards see that the theory of final causes is not committed to the denial of the existence of accident in nature. It may even be said that it is accident that calls forth the theory of finality, for it is because we find the fortuitous in nature that we ask ourselves, Why is the whole not fortuitous? But if the detail appears fortuitous, the whole is not, and has, indeed, all the character of a plan.

It is known that it was by a reason drawn from the simplicity of the plan of the universe that Copernicus rose to the conception of the true system of the world. Alphonso the Wise, King of Castile, offended by the complications which the system of Ptolemy assumed, said: 'If God had called me to His counsels, things would have been in better order.' Well, it turned out that he was right. It was not the order of the universe that was at fault, but the system. It was to avoid the complications of the system of Ptolemy that Copernicus sought a simple arrangement, which is precisely that which exists. 'He had the satisfaction,' says Laplace, 'to see the observations of astronomers fit in with his theory. . . . Everything in this system told of that fair simplicity which charms us in nature's means, when we are happy enough to know them.'[3] Thus Laplace perceived that the simplest laws are the most likely to be true. But I do not see why it should be so on the supposition of an absolutely blind cause; for,

[1] Cournot, *Essai sur les idées fondamentales*, l. ii. c. xii.
[2] Cournot, *Matérialisme, vitalisme, rationalisme*, p. 70.
[3] Laplace, *Exposition de la mécanique céleste*, t. v. c. iv.

after all, the inconceivable swiftness which the system of Ptolemy supposed in the celestial system has nothing physically impossible in it, and the complication of movements has nothing incompatible with the idea of a mechanical cause. Why, then, do we expect to find simple movements in nature, and speed in proportion, except because we instinctively attribute a sort of intelligence and choice to the first cause? Now experience justifies this hypothesis; at least it did so with Copernicus and Galileo. It also did so, according to Laplace, in the debate between Clairaut and Buffon, the latter maintaining against the former that the law of attraction remained the same at all distances. 'This time,' says Laplace, 'the metaphysician was right as against the geometrician.'[1]

Above all, when one considers the stability of the solar system, one is astonished to see how near this stability came to having been for ever impossible, and especially how constantly it was in peril. 'In the midst of the maze of augmentations and diminutions of swiftness,' says Arago, 'of variations of forms in the orbits, of changes of distances and inclinations which these forces must evidently have produced, the most skilful geometry itself could not have succeeded in finding a strong and reliable clue. This extreme complication gave birth to a discouraging thought. Forces so numerous, so variable in position, so different in intensity, could seemingly only be maintained perpetually in balance by a sort of miracle. Newton went so far as to suppose that the planetary system did not contain in itself elements of indefinite preservation; he believed that a powerful hand must have intervened from time to time to repair the disorder. Euler,

[1] Laplace, *Exposition de la méchanique céleste*:—'Clairaut maintained that the law of Newton, reciprocal to the square of distances, is only perceptible at great distances, but that attraction increases in a greater ratio than the distance diminishes. Buffon assailed this conclusion, founding on this, that the laws of nature must be simple, that they can only depend on a single model, and that the expression of them can only embrace a single term. But Clairaut found that on carrying the calculation farther, the law exactly expressed the result of the observations.'

although more advanced than Newton in the knowledge of planetary perturbations, no more admitted that the solar system was constituted so as to last for ever.'[1]

And yet 'universal gravitation suffices to conserve the solar system; it maintains the forms and inclinations of the orbits in a mediate state, around which the variations are slight: variety does not involve disorder; the world presents harmonies and perfections of which even Newton doubted. This depends on circumstances, which arithmetic revealed to Laplace, and which, on vague observation, did not seem to exercise so great an influence. For planets all moving in the same direction, in orbits slightly elliptical, and in planes but little inclined to each other, substitute different conditions, and the stability of the world will be anew imperilled, and in all probability there will result a frightful chaos. The author of the *Méchanique céleste* brought out clearly the laws of these great phenomena: the variations in the speed of Jupiter, Saturn, and the moon had, it was found, evident physical causes, and belonged to the category of common and periodical perturbations dependent on gravity; the vast differences in the dimensions of the orbits became a simple oscillation contained within narrow limits; in fine, by the omnipotence of a mathematical force, the material world is found established on its foundations.'[2]

Thus it is in virtue of a mathematical law that the world subsists; but a mathematical law is absolutely indifferent to this or that result. What does it signify to universal attraction that the world does or does not subsist? But it is the case that that force which begets the solar system has in itself that wherewith to conserve it. It happens that particles of matter, in themselves indifferent to the formation of this or that order, and obeying a law as deaf and dumb as they, have hit upon an equilibrium and a state of stability which seems, according to Arago, the effect of a miracle. To grant that

[1] Arago, *Notices scientifiques*, t. iii.; Laplace, p. 475.
[2] Arago, *Notices scientifiques*, t. iii.; Laplace, p. 475.

such a stability and such an order is the result of a happy accident, which at some remote time made order arise out of chaos, and found this point of equilibrium between so many diverse and divergent forces, is neither more nor less than the doctrine of mere chance.

I know that the *laws* and *forces* of nature are perpetually appealed to, and that to nature itself a sort of divinity is attributed. Be it so; but then this is to suppose that these laws, these forces, this nature, though destitute of consciousness and reflection, have yet a sort of obscure and instinctive foresight, and are guided in their action, without knowing it, by the general interest of the whole. But this, again, is finality. Only once admit that the effect to be produced has been one of the factors, one of the co-operating elements of a system, and you thereby admit final causes. On the other hand, rob nature, its forces and its laws, of all clear or obscure foresight of the future, of all instinct, of all interest; reduce these words to precise notions, namely, nature, to the whole of things, that is, of bodies; the forces of nature to the properties of these bodies; the laws of nature to the relations arising from these properties; and it follows that it is only by fortuitous rencounters and external relations that the world can have been formed. In a word, either the order of the world is a result, that is, an accident, and is the effect of chance, or else there must be in nature a principle of order, that is, a principle which reduces multiplicity to unity, which directs the present towards the future, and which, consequently, obeys (whether it knows it or not) the law of finality.

The series of preceding inductions might be pushed still farther, by inquiring whether the very existence of *laws* in nature is not itself a fact of finality. No doubt nature cannot be imagined as without a cause, but it can be imagined as without laws. John Stuart Mill confused this when he affirmed in his *Inductive Logic*[1] that it is possible to conceive a world freed from the law of causality. He expressed him-

[1] Stuart Mill, *System of Logic*, l. iii. chap. xxi. § 4.

self badly here, for no effort of our mind permits us to conceive a phenomenon spontaneously originating from nothing, without being called forth by something previous; but what we can conceive are phenomena without order, bond, or any regularity, of which all the combinations should appear fortuitous, and which should not permit any certain foresight for the future. Thus it is, in appearance at least, with the ravings of madness; the words, no longer expressing ideas, are united to each other in a purely fortuitous manner, without any constant and regular mode, and as if they were taken by chance from a dictionary. There is no reason why the phenomena of the universe should not be produced in the same manner, if there be supposed at the beginning elements purely material, in which there pre-existed no principle of order and harmony.

'To consider only the laws of motion,' says a philosopher, 'there is no reason why the small or elementary bodies continue to group themselves in the same order rather than to form new combinations, or even no longer to form any. In fine, the very existence of these small bodies would be as precarious as that of the great, for they have no doubt parts, since they have extension; and the cohesion of these parts can only be explained by a concourse of motions impelling them incessantly towards each other. They are thus in their turn nothing but systems of motions, which the mechanical laws are of themselves careless to preserve or to destroy. The world of Epicurus, before the concourse of the atoms, presents us with but a feeble idea of the degree of dissolution into which the universe, in virtue of its own mechanism, might be reduced from one moment to another. We can still imagine cubes or spheres falling in the void, but we cannot imagine that sort of infinitesimal powder, without shape, colour, or property, appreciable by any sense. Such a hypothesis to us appears monstrous, and we are persuaded that even when this or that law shall come to be disproved, there will always remain a certain harmony between the elements of the

universe. But how should we know this, did we not admit *à priori* that this harmony is in some sort the supreme interest of nature, and that the causes of which it seems the necessary result are only the means wisely concerted to establish it?'[1]

We do not, with the author of this passage, consider it necessary here to appeal to a belief *à priori*; but the mere fact of the existence of any order whatever appears to us to testify to the existence of another than the mechanical cause. The latter, in effect, as he says, cares not to produce any regular combination. If, however, such combinations exist, and have lasted for a vast time, without the primordial chaotic state having ever been met with at any time or in any place, it is because matter has been directed, or has directed itself, with a view to produce these systems, plans, and combinations, whence results the order of the world; which amounts to saying that matter has obeyed another cause than the mechanical. If it has been directed, there must be outside of it an intelligent and spiritual cause; if it has directed itself, itself must be an intelligent and spiritual cause. In both these cases the order of finality rises above the mechanical order. If, meanwhile, we ask what are the laws of nature, we shall see that they are only, as Montesquieu has said, the constant relations which result from the nature of things. That these constant relations may exist, the nature of things must itself be constant, which supposes that a certain order exists even in the formation of these primary systems of motions which compose the elementary bodies; and if we consequently discover finality even in the origin of these elementary bodies, we must find it in the laws which are only the result of them. As to the belief we have that the order of nature will always continue (under one form or another), and that there will always be laws, we explain it by the axiom that 'the same causes always produce the same effects.' If an unknown wisdom is the cause of the order which we admire in the universe, that same

[1] Lachelier, *Du fondement de l'induction*, pp. 79, 80.

wisdom could not let this order perish without becoming folly; and to say that it might cease to be, would be to say that it is accidental and contingent in its nature—that is, that it depended on matter, which is contrary to the hypothesis. If, finally, it were supposed that it would one day become impotent, it would be supposed without proof; for having hitherto been powerful enough to govern nature, why should it cease to be so? Our confidence in it has no reason, then, to vanish before a gratuitous doubt.

Without doubt, on any hypothesis, there will always remain, in order to constitute nature and to give it a rule, the laws of motion. 'But the part of these laws,' as the author quoted again says, 'is limited to subordinating each motion to the preceding, and does not extend to mutually co-ordinating several series of motions. It is true that if we knew at a given moment the direction and the rapidity of all the motions which are executed in the universe, we could exactly deduce therefrom all the combinations which must result; but induction precisely consists in reversing the problem, by supposing, on the other hand, that the whole of these directions and of these rates of speed must be such as to reproduce at a given point the same combinations. But to say that a complex phenomenon contains the reason of the simple phenomena which concur to produce it, is to say that it is their final cause.' [1]

Who knows, meanwhile, whether one might not ascend

[1] Lachelier, *Du fondement de l'induction*, p. 78. We agree at bottom with the author we quote. Perhaps, however, we differ in the manner of presenting the same argument. M. Lachelier appears to believe that we know beforehand that the series of phenomena will produce at a given point the same combinations (for instance, the motion of the stars, the perpetuity of species), and this belief, which appears to him the foundation of induction, is the principle of final causes. For us, on the other hand, the periodic reproduction of phenomena is a simple fact; whatever it may be as to the future, this fact has existed in the past, and it exists still in the present, and it lasts long enough not to be the effect of chance: therefore it has a cause, but this cause is, for the reasons given, other than the mechanical laws. We rise, then, to the final cause by the principle of causality, which embraces at once both the mechanical and the final causes. (See chap. i.)

still higher, and maintain that the laws of motion themselves are not laws purely mechanical and mathematical? Leibnitz believed it; he thought that these laws are contingent—that they are laws of beauty and convenience, not of necessity—that they are derived from the divine goodness and wisdom, not from the essence of matter. The authority of so great a name, one of the founders of modern dynamics, should impress those who believe it so easy to explain all by brute matter. Unhappily, we would need more mathematical and physical knowledge than we have in order to pursue this discussion to its limit.

However it may be as to this last point, let it suffice us to have shown: 1st, That the physical and mechanical order is not exclusive of finality; 2d, That all order in general, even physical and mechanical, already implies a certain finality.

If this be so, then the principle of mechanical concordance is not essentially distinguished, as we had at first thought, from the principle of teleological concordance. The first is only the primary form, the rudimentary and obscure form of the second, and is only explained by the latter. It was, then, on our part, quite a provisional concession, and in order to avoid a premature discussion, that we admitted at the commencement of these studies a mode of combination foreign to finality. We now see that finality penetrates everywhere, even where it seems the least visible, and we can say, in a more general manner than we have yet done, all order supposes an end, and the very principle of order is the end.

Only we think we must distinguish two kinds of finality,—the finality of *use* or of *adaptation*, and the finality of *plan*. In both there is *system*, and all system implies co-ordination; but in the one the co-ordination results in a final effect which takes the character of an end, in the other the co-ordination has not this effect. In both cases there is finality, because the most simple co-ordination already implies that the idea of the whole precedes that of the parts—that is, that the successive arrangement of the parts is regulated for the arrangement

which behoves to be ultimately attained. Only in the finality of plan, when order is realized, it seems that all is finished; while in the finality of use, this order itself is co-ordinate to something else, which is the interest of the living being. Let us repeat that the finality of plan may have an end, but an external end (for instance, the arrangement of the sun, which heats and illuminates the earth); while in the finality of use the end is internal to the being itself, as in the animal. The finality of plan is, then, an internal finality, in so far as one only considers the plan itself—for instance, the solar system; it is external, if it is found to have some relation to the use of other beings.

Although the finality of plan reigns especially in inorganic nature, and that of use in living beings, yet we find both at once in the latter, the *plan* beside the *adaptation*, and the one is not always in harmony with the other; in every case the one is different from the other. The adaptation of the organs to the functions, and the functional co-operation of the organs, is one thing; the correspondence of the parts, their proportions, their symmetry, is another. There is a sort of geometry of living beings, independent of mechanics, and which does not seem to have a useful result as an end. Symmetry, for instance, is certainly one of the wants of living nature. Four kinds of it are to be distinguished: 1st, The *radiated* symmetrical type, as in the radiata, where the homogeneous parts are grouped round a common centre; 2d, The *branched* symmetrical type, as in the vegetables and the polyps; 3d, The *serial* type, in the succession from head to tail, as in the articulata; 4th, The *bilateral* type, or repetition of the like parts of the two sides of the body, as in the higher animals and man. These facts show us that living nature has also its geometric forms, only much more free and more rounded than those of the crystals.

Independently of the geometric forms, the proportions and symmetries which are remarked in animated beings, there are arrangements of parts which allow us to classify all the

animals in four very distinct compartments, whether these compartments be absolutely separated, as Cuvier believed, or there be passages from one to the other, as G. St. Hilaire thought. If the principle of adaptation alone ruled in the structure of the animals, it seems that the most natural classification would be that which at first occurred to men's minds, namely, that which originates in the diversity of habitable media. Now there are three habitable media—water, air, and earth; hence three great classes of animals—aquatic, flying, and terrestrial. From these three great divisions should result all the zoological divisions and subdivisions. However, it is found that this classification is superficial, and that which has prevailed is founded not on the use of the parts, but on the *design* of the animal. The *types*, not the functions, serve as the basis of all zoological nomenclature. It is evident what importance is attached in the zoological sciences to the finality of plan.

This finality appeared so important to a famous naturalist, M. Agassiz, that he thought the proof of the existence of God ought to be sought much more in the plan of the animals than in the adaptation of the organs, which is, in our opinion, a great exaggeration. Nevertheless, it is certain that the creation of a type (apart even from all adaptation) is inseparable from the idea of plan and end, and consequently supposes art.[1] Agassiz especially mentions the following facts, so unlike the blind combinations of a purely physical nature: on the one hand, the simultaneous existence of the most diverse types in the midst of identical circumstances; on the other, the repetition of similar types in circumstances the most diverse, the unity of plan in the most diverse beings, etc. These facts, and all those which Agassiz accumulates with the profoundest knowledge of the question, always bring us back to this: how could blind elements, not having in themselves any principle of direction, have been able to find stable and constant combinations, and that indefinitely? All *design* supposes

[1] Agassiz, *De la classification en zoologie*, p. 214 et seq.

a designer. The figures of nature, whatever they be, have precise and distinct contours. Can the play of the elements have designed the human figure?

The finality of plan which we remark in the whole of nature brings us to *esthetical finality,* which is a form of it. This is not the place to handle the question of the beautiful; but whatever be the intimate essence of the beautiful, all the schools are agreed in recognising that it implies a certain accord between the parts and the whole—*unitas in varietate.* Must there not then be, in order that nature may be beautiful, some principle which reduces diversity to unity? It will not suffice to meet this difficulty to derive everything, with Spinoza, from a single substance; for the question is not of a unity of origin, but of a unity of agreement, proportion, and harmony. The question is not of an abstract and vague identity, but of a moral and intelligible unity, resulting from the diversity itself. The unity of action in the tragedy does not consist in presenting a unique personage or a unique situation, but in uniting, as in a centre, on a given point the divergent passions and the contrary interests of several distinct personages. A unity which should send forth from its womb series of phenomena to infinitude would not suffice to produce the sentiment of the beautiful; it must distribute them, group them, bind them together, consequently watch their evolution, conduct them where it will, impose upon them a measure and a rule—in a word, a type and a plan. The same law which has made us recognise finality in every regular composition, compels us to recognise it in the beautiful. Nature is no more an artist by chance than a geometrician; its esthetic is no more fortuitous than its industry. It is because there is an industry of nature, a geometry, an esthetic of nature, that man is capable of industry, of geometry, and esthetic. Nature is all that we are, and all that we are we hold from nature. The creative genius which the artist feels in himself is to him the revelation and the symbol of the creative genius of nature.

CHAPTER VI.

OBJECTIONS AND DIFFICULTIES.

MOST of the objections and difficulties raised at all times, and particularly in our days, against final causes, have been by implication examined in the preceding discussions. However, it is necessary to resume them more distinctly and in themselves, by presenting them in their totality, setting them forth with all their advantages—that is to say, in the very words of the thinkers who have given them the authority of their names.

I. Objection of Bacon. *The sciences and final causes.*

'The habit of seeking *final causes* in physics,' says Bacon, 'has expelled and, as it were, banished from it the *physical causes.* It has brought it about that men, reposing in appearances, have not given themselves to search for real causes. In effect, if, to explain certain arrangements and conformations of the human body, it be said that the eyelids, with the hairs which cover them, are like a hedge for the eyes; or that the hardness of the skin on animals is intended to preserve them from heat or cold; or that the bones are like so many columns or beams which nature has raised to serve to support the human body; or, again, that trees put forth leaves in order to be less exposed to the sun or the wind; that the clouds are carried towards the upper region in order to water the earth by showers; or, in fine, that the earth has been condensed and consolidated in order that it may serve as a firm abode, a basis for animals, all explanations of this kind are like those sea-lampreys which, as certain navigators have imagined, fasten upon vessels and stop them. . . . They have caused the investigation of physical causes to be long

neglected; moreover, the philosophy of Democritus, and of those contemplative authors who have discarded God from the system of the world, appears to us, as regards physical causes, to have more solidity than those of Plato and Aristotle.'[1]

From this objection of Bacon is dated and has originated the war which men of science since then have not ceased to wage against final causes. But this warfare arises from a mistake. We have already said that men of science are alone judges of the method which it is suitable to employ in the sciences. If they have sufficiently verified by experience that final causes deceive more than they serve them; if they have, in fact, the troublesome effect of turning aside the mind from the investigation of physical causes, and of thus encouraging a slothful philosophy, we at least will not dispute this right with them. The objection of Bacon may have had a historical basis, and may, to a certain extent, have it still. It might be shown that in certain cases—for instance, in the case so often quoted of the valves of the heart—the final cause has guided to the physical cause. One might say with Schopenhauer, that, in physiology, the final cause is often more interesting than the physical.[2] But yet, once more, this is a question for men of science to discuss. Let them settle it as they think best; let them absolutely exclude teleological investigations, or use them to a certain extent, it is their affair. Their function is to discover facts and laws. When they have observed true facts and discovered true laws, they have done their work, and there is nothing further to be asked of them.

But if, meanwhile, by abstaining from final causes, they think they have actually excluded and suppressed this notion from the human mind, they change the question. From a question of logic and method, they pass without hesitation to a metaphysical and fundamental question; and these are two profoundly different points of view. Because the first is de-

[1] Bacon, *De Dignitate Scientiarum*, b. iii. c. iv.

[2] *Die Welt als Wille*, t. ii. chap. 26. For instance, he says: 'It is more interesting to know why the blood circulates than to know how it circulates.'

termined in one way, it by no means follows that the second is so in the same way as well. Because you remove final causes from your methods, does it follow that there are none? When Bacon removed final causes from physics, in order to remit them to metaphysics, it was no vain subterfuge, but a distinction as solid as profound. The physicist seeks for the physical and concrete conditions of phenomena; the metaphysician seeks their intellectual signification. But the second of these points of view is in no way excluded by the first; and after having explained how things happen, it is still competent to ask why they happen thus. The question of the how does not exclude that of the why, and leaves it entirely open.

When scientists, after having eliminated final causes from their methods (which they have a right to do), proceed to banish them from reality itself, they do not see that they are then no longer speaking as scientists, but as philosophers; and they do not distinguish these two parts. They attribute to themselves the same infallibility as philosophers which they have as scientists; they believe that it is science that pronounces by their mouth, while it is only free speculation. This distinction is very important, for it removes many equivocations and mistakes. A scientist, however bound he may be by the severities of the scientific method, yet cannot escape the temptation to think, to reflect on the phenomena whose laws he has discovered. Like other philosophers, he gives himself up to reasonings, inductions, analyses,—to conceptions no longer belonging to the domain of experience, but which are the work of thought operating on the data of experience. It is clearly his right, and no one will complain that scientists should be at the same time philosophers; it may even be thought that they are not so enough. But forthwith to attribute to these personal interpretations the authority which attaches to science itself, is to commit the same error, the same abuse of power, as that of the priests of the Middle Ages, who availed themselves of the respect due to religion to cover all the acts of their temporal power.

The error of the scientists[1] is in believing that they have eliminated final causes from nature, when they have shown how certain effects result from certain given causes; the discovery of the efficient causes appears to them a decisive argument against the final causes. According to them, we must not say 'that the bird has wings in order to fly, but that it flies because it has wings.' But wherein, I ask you, are these two propositions contradictory? In assuming that the bird has wings in order to fly, must not its flight result from the structure of these wings? Consequently, because the flight is a result, is it right to conclude that it is not at the same time an end? Would it, then, be necessary, in order to recognise final causes, that you should see in nature effects without a cause, or effects disproportioned to their causes? Final causes, we cannot too often repeat it, are not miracles.[2] In order that there may be a final cause, the primary cause must have chosen second causes precisely fit for the desired effect. Consequently, what wonder is it that in studying these causes you should mechanically deduce their effects? The contrary would be impossible and absurd. Explain to us, then, as much as you please, that, given wings, the bird must fly, that does not at all prove that it has not wings in order to fly; for I ask you in good faith, if the author of nature willed that birds should fly, what better could he do than give them wings?

This agreement of efficient and final causes has been admirably expressed by Hegel in a passage as sprightly as it is profound: 'Reason is as *cunning* as it is *powerful*. Its cunning consists in this, that while it permits things to act upon each other, conformably to their nature, and to employ themselves in this labour, without mixture and confusion, it thereby does nothing but realize its ends. It may in this

[1] I mean by this scientists who deny final causes, in which they are far from being unanimous. While we can cite authorities such as Cuvier, Blainville, Müller, Agassiz, and so many others, we may be allowed to say that it is far from being the case that *science* proscribes final causes.

[2] See above, p. 118.

respect be said that Divine Providence is, in face of the world and the events which occur in it, the *absolute cunning*. God causes man to find his satisfaction in his passions and private interests while He accomplishes His ends, which are other than these passions and interests have in view.'[1]

II. Objection of Descartes. *Ignorance of ends.*

Descartes, like Bacon, and even more than he, has shown himself opposed to final causes, for Bacon only removed them from physics to relegate them to metaphysics. Descartes, on the other hand, seems to exclude them at once from metaphysics and from physics, or at least he refuses to make use of them in either of these two sciences. It is not that he denies the existence of ends in nature, but he thinks that we cannot know them, because of the infirmity of our mind. Hence this objection, so often reproduced by able men, namely, that it belongs not to us to sound the intentions of the Creator.

We ought always, he says, to keep before our eyes 'that the capacity of our mind is very mediocre, and not to presume too much on ourselves, as it seems we would do were we to persuade ourselves that it is only for our use that God has created all things, or even, indeed, *if we pretended to be able to know by the force of our mind what are the ends for which He has created them.*'[2]

In this passage, Descartes mingles two distinct objections,—one to which we shall soon recur, and which is directed against the prejudice which would make man the last end of the creation; the other, which occupies us at present, and which is founded on the disproportion between the powers of the human and the divine mind, and on ignorance of ends.

This objection, as it seems to us, rests on an easily disentangled confusion between absolute and relative ends. If even it were not known to what end God has created all things,—that is, when their final destination was unknown,—it would

[1] Hegel, *Grande encyclopédie*, p. 209.
[2] *Principes de philosophie*, iii. 2. See also in the *Méditations*, iv.

not follow that we could not know in any given being the relation of means to ends. Suppose I do not know to what end God has given sight to the animals, does it follow that I am forbidden to affirm that the eye has been made for seeing? Because I do not know why God has willed that there should be vegetables, does it follow that I cannot recognise the relation of correspondence and adaptation which is to be seen between their parts? The same objection rests upon yet another confusion,—made, too, by all the philosophers before Kant,—that of external and internal finality.[1] No doubt, I can affirm nothing with exactness regarding external finality, because it is not written in the constitution of the being itself. But even if I could not say why God has made vipers, it would not follow that the internal organization of the viper does not manifest relations of adaptation, which I am entitled to call relations of finality.

It is remarkable that a votary of empiricism and Epicureanism, Gassendi, has defended the principle of final causes against Descartes. 'You say,' he answers Descartes, 'that it does not seem to you that you could investigate and undertake to discover, without rashness, the ends of God. But although that may be true, if you mean to speak of ends that God has willed to be hidden, still it cannot be the case with those which He has, as it were, exposed to the view of all the world, and which are discovered without much labour.'[2] Then, instancing the marvellous arrangement of the valves of the heart, he asks why 'it should not be permitted to admire this wonderful action and that ineffable Providence which has so conveniently arranged these little doors at the entrance of these concavities . . . and which has not only arranged these things conformably to their end, but even all that we see most admirable in the universe.'

Pressed by this objection, Descartes is indeed obliged to grant the reality of it, and upon the pain of assuming against

[1] See above, p. 157.

[2] Gassendi, *Objections à la 4e méditation* (edit. Cousin, t. ii. p. 179).

Gassendi himself his part of Epicurean, he must consent to recognise 'that a work supposes a worker.' Only he thinks to escape the objection by a sort of evasion, inadmissible in good philosophy, namely, that the preceding argument is founded on the efficient, not on the final cause. This is a manifest confusion. No doubt, when we say the work supposes a worker, we pass from the effect to the efficient cause; it is even merely a tautology, for he who says work says a thing made by a worker. But the stress of the argument just consists in affirming that such a thing is a work (*opus*), and not merely a simple effect; and this we can only do by comparing means with ends; consequently, by the principle of final causes. If the contemplation of ends is forbidden us, the consideration of means is equally so. The agreement of the one with the other has no longer any significance, and nothing warrants us to consider the work as a work of wisdom, and consequently to conclude the existence of a worker. No doubt the world still remains as an effect which requires a cause; but it is enough for us to know that this cause is powerful, without deciding whether it is wise. Consequently there is no middle way for Descartes: he must either permit the consideration of the final cause, or renounce, as Gassendi objects to him, the recognition of Providence in nature.

Another contemporary of Descartes, eminent in the physical sciences, has replied very justly and precisely to the objection of Descartes. We mean Robert Boyle.

'Suppose that a peasant, entering in broad daylight the garden of a famous mathematician, finds there one of those curious gnomonic instruments which indicate the position of the sun in the zodiac, its declination from the equator, the day of the month, the length of the day, etc. etc.; it would, no doubt, be a great presumption on his part, ignorant alike of mathematical science and of the intentions of the artist, to believe himself capable of discovering all the ends in view of which this machine, so curiously wrought, has been constructed; but when he remarks that it is furnished with an

index, with lines and horary numbers, in short, with all that constitutes a sun-dial, and sees successively the shadow of the index mark in succession the hour of the day, there would be on his part as little presumption as error in concluding that this instrument, whatever may be its other uses, is certainly a dial made to show the hours.'[1]

III. *The abuses of final causes.*

One of the most widespread objections against final causes is derived from the abuse which has been made of them, and which can easily be made. Such abuse has been, in fact, very frequent. The chief instances are these:

1. The first and principal abuse of final causes, which is now hardly any more to be found, but which long prevailed, is to make use of this principle as an argument against a fact, or against a law of nature, even when that fact or law was demonstrated by experiment and calculation—that is, by the strictest methods which human science can employ. There is not now a single scientist who would dare to reject a fact because its final cause was not seen, or because it appeared contrary to some final cause which had been devised beforehand in the mind. But it has not always been so.

For instance, one of the most beautiful astronomical discoveries of modern times, due, if I mistake not, to the profound genius of Herschell, is that of the double and multiple stars—that is, of stars revolving round other stars, and serving them in some sort as planets. Till then, it had been believed

[1] Boyle, *Letter on Final Causes.* J. J. Rousseau, in the *Emile*, replies to the same objection nearly in the same manner: 'I judge of the order of the world, although I know not its end, because to judge of this order I only need mutually to compare the parts, to study their functions, their relations, and to remark their concert. I know not why the universe exists, but I do not desist from seeing how it is modified; I do not cease to see the intimate agreement by which the beings that compose it render a mutual help. I am like a man who should see for the first time an open watch, who should not cease to admire the workmanship of it, although he knew not the use of the machine, and had never seen dials. I do not know, he would say, what all this is for, but I see that each piece is made for the others: I admire the worker in the detail of his work, and I am very sure that all these wheelworks only go thus in concert for a common end which I cannot perceive.'

that every star must play the part of a sun, that is, of a centre, and that around that sun only dark bodies could gravitate, receiving the light of the central sun. It is now proved that there are suns which gravitate around other suns, and this discovery has enabled Bessel to apply to the stellar universe the great Newtonian system of gravitation, which, till then, was only applicable to our solar system. But when this theory began to come to light, towards the end of the 18th century, a celebrated astronomer of the time, Nicholas Fuss, rejected it, relying on the principle of final causes. 'What is the good,' said he, 'of some luminous bodies revolving round others? The sun is the only source whence the planets derive light and heat. Were there entire systems of suns controlled by other suns, their neighbourhood and their motions would be objectless, their rays useless. The suns have no need to borrow from strange bodies what they have themselves received as their own. If the secondary stars are luminous bodies, what is the end of their motions?' To this question of Nicholas Fuss it is easy to reply that we do not know what is that end; but if the fact is proved by experience, as it really is, we ought to admit it as a fact, whatever may be its end, and without even asking if it have one. Such aberrations give too much scope to the adversaries of final causes; and Arago, in relating to us these words of (what is rare) a too teleological astronomer, could say with the somewhat haughty satisfaction of a scientist who has found metaphysic at fault: 'Such were regarded as profound objections in 1780. Well, these things which seemed good for nothing, which appeared without end, without use, really exist, and have taken their place among the most beautiful and incontestable truths of astronomy.' We must conclude with the same scientist that the principle *cui bono* has no authority in the positive sciences, and cannot serve as an argument against the truth of a fact or a law.

Let us take another example of the same illusion. Although the theory of the motion of the earth encountered especial

theological prejudices at the first, it has also had to contend against this philosophical prejudice, that man is the final cause of all things, the centre and end of the creation. Taking for granted that all has been made for man, one was thus led to give to the earth a privileged place in the universe, and it appeared natural that the creature who was the end of all things should inhabit the centre of the world. To bring down the earth from this high rank to the humble destiny of a satellite of the sun was, as it was believed, to put in peril the excellence and majesty of human nature, and to throw a veil over the grandeur of its destinies; as if the greatness of man could consist in inhabiting a motionless centre rather than a moveable planet; as if it concerned his destiny that the stars had been made to turn round him, and to afford him a diverting spectacle; as if, in fine, to discover the true system of the world were not a more brilliant proof of his greatness than the little privilege of inhabiting the centre of the world.[1]

2. An abusive employment of the principle of final causes has been made not only to oppose speculative truths, but inventions practical and useful to men. Euler, in his letters to a princess of Germany, speaking of the possibility of preventing the effects of lightning, tells us: 'Even if the thing succeeded, still there are many persons who would doubt whether it was lawful to make use of such a remedy. In effect, the ancient pagans would have regarded him as impious who should undertake to stop Jupiter in casting his thunderbolts. Christians who are assured that lightning is a work of God, and that Divine Providence often employs it because of the wickedness of men, could equally say that it is an impiety to seek to oppose sovereign justice.' At the epoch

[1] See also the argument drawn from the abhorrence of a vacuum, to which Pascal alludes (*Pensées*, ed. Havet, t. i. p. 155): 'To act with a view to an end belongs only to an intelligent nature. But not only is everything co-ordinated in relation to the particular end, but also everything conspires to the common end of all, as is seen in water, which rises contrary to its nature, lest it should leave a void to break the great contexture of the world, which is only maintained by the uninterrupted adherence of all its parts.' This argument is taken from Grotius (*De Veritate Religionis Christianæ*, lib. i. chap. vii.).

of Jenner's great discovery, an English physician, Dr. Rowley, said of small-pox, 'that it is a malady imposed by the decree of heaven;' and he declared vaccination 'an audacious and sacrilegious violation of our holy religion. The designs of these vaccinators,' he added, 'appear to defy heaven itself, and the very will of God.'[1] On the introduction of winnowing machines, certain fanatical Scottish sects opposed them, on the pretext that the winds were the work of God, and that it is sacrilege in man to wish to raise them at will. The wind thus artificially obtained was called the *devil's wind.* Walter Scott, in his charming work on the Scottish Puritans, has not failed to introduce this interesting trait of manners.[2] In fine, even in our days, on the introduction of anesthetic agents, many minds have opposed them, appealing to the curative function of pain in surgical operations.

3. A third abuse of final causes consists in employing them as the explanation of a phenomenon which does not exist. Fenelon, in his *Treatise on the Existence of God,* maintains that the moon was given to the earth to give it light during the absence of the sun. 'She appears at the right time, with all the stars,' says he, 'when the sun has to go away to bring the day to other hemispheres.' This opinion furnished to Laplace the occasion of a victorious refutation: 'Some partisans of final causes,' says he, 'have supposed that the moon was given to the earth to give it light by night. In that case, nature would not have attained the end it had proposed to itself, since we are often deprived at once of the light of the sun and of that of the moon. To attain it, it would have sufficed, at the beginning, to place the moon opposite the sun in the same plane of the ecliptic, at a distance from the earth equal to the hundredth part of the

[1] *Revue Britannique* (August 1861).

[2] The old Mause says to her mistress: 'Your ladyship and the steward are wishing Cuddie to use a new machine to winnow the corn. This machine opposes the designs of Providence, by furnishing wind for your special use, and by human means, in place of asking it by prayer, and waiting with patience till Providence itself send it.' (See *Old Mortality,* chap. vii.)

distance of the earth from the sun, and to give to the moon and the earth parallel rates of movement proportional to their distances from that luminary. Then the moon, constantly opposite the sun, would have described around it an ellipse similar to that of the earth; these two luminaries would have succeeded each other above the horizon; and as at that distance the moon would not have been eclipsed, its light would constantly have replaced that of the sun.'[1] Here, it must be confessed, the scientist is right as against the theologian. Thus it is that by an indiscreet use of final causes, Providence is exposed to receive a lesson in mathematics from a simple mortal.[2]

4. Lastly, there come the puerile and frivolous applications of final causes, applications which fill books, no doubt excellent, but more fitted to edify than to instruct. Some of these applications are so ludicrous, that one could believe them invented to ridicule the theory itself. When Voltaire, who was, however, as he calls himself, a final causist, wrote in Candide, 'Noses are made to bear spectacles; let us also wear spectacles,' he said nothing more pleasant than some of the assertions of Bernardin de Saint-Pierre in his *Studies* and in his *Harmonies of Nature*. M. Biot, in a charming article on 'The Exact Ideas in Literature,'[3] has cited several examples of them which are hardly credible. Thus, according to Bernardin de Saint-Pierre, 'dogs are usually of two opposite colours, the one light and the other dark, in order that, wherever they may be in the house, they may be distinguished from the furniture, with the colour of which they might be confounded.

[1] Laplace, *Exposition du système du monde*, l. iv. c. vi.

[2] An error of the same kind is that of Hippocrates, who admires the skill with which the auricles of the heart have been made 'to blow the air into the heart' (Littré, *Œuvres d'Hippocrate*, t. ix. p. 77). It is with reference to errors of this kind that Condorcet wrote: 'This optimism, which consists in finding everything admirable in nature as they invent it, on condition of equally admiring its wisdom if unfortunately it has been discovered to have followed other combinations,—this optimism of detail ought to be banished from philosophy, the end of which is not to admire but to know' (*Fragment sur l'Atlantide*).

[3] Biot, *Mélanges*, t. i.

. . . Wherever fleas are, they jump on white colours. This instinct has been given them, that we may the more easily catch them.'

To these amusing instances cited by Biot, one might add others not less so. Thus, Bernardin de Saint-Pierre informs us 'that the melon has been divided into sections by nature for family eating,' and he adds 'that the pumpkin, being larger, can be eaten with one's neighbours.'[1] On reading such puerilities, one may well exclaim with M. Biot, 'Seriously, are these things harmonies of nature?' An English author, Buckland,[2] asks why the lamb is eaten by the wolf, and replies: 'We have here a proof of the goodness of Providence, for thereby it escapes sickness and old age.' Such apologies for Providence make more atheists than believers; at the most, they might be excusable when addressed to children, but philosophy is meant to speak to men.

If we sum up what is common in all the abuses we have just instanced, we shall see that the error does not consist in admitting final causes, but in assuming false ones. That there are erroneous and arbitrary final causes there is no doubt; that there are none at all is another question. Men are as often mistaken regarding efficient as regarding final causes; they have as often attributed to nature false properties as false intentions. But as the errors committed regarding the efficient cause have not prevented scientists from believing that there are true causes, so the illusions and prejudices of the vulgar with respect to final causes ought not to determine philosophy to abandon them altogether.

As regards the first point, we have already seen that the final cause ought in no way to restrict the liberty of science. No preconceived idea can prevail against a fact: but the fact once discovered, nothing forbids us to seek its finality. 'We must,' as M. Flourens has justly said, 'proceed not from final causes to facts, but from facts to final causes.'

[1] *Etudes de la nature*, Etude xi., 'Harmonies végétales.'
[2] Quoted by Jules Simon in his book, *De la religion naturelle*, part 2, chap. i.

As to the second point, the final cause, far from forbidding any useful invention, justifies them all beforehand, and *à priori*. For, without even going so far as to say that all has been made for man's use, it suffices that man, having been created industrious, has been made to make use of all things, in order that every new invention may thereby be warranted as implicitly willed by Divine Providence. It is only, then, an unenlightened superstition, and not the doctrine of final causes, which is here in question.

For the third point, we shall say as before, that one must advance 'from facts to final causes, and not from final causes to facts.' Thus understood, this theory can in no way favour any scientific error.

And for the fourth point, one must distinguish accidental from essential final causes. The first are the more or less arbitrary uses which men obtain from external things, and which have not always been attached to them; the second are the uses inherent in the very essence of the things—for instance, the uses of the organs.[1] Abuses of this kind almost always arise from confounding external and internal finality; and this very confusion is the source of the most part of the objections directed against this theory, and, in particular, of the following objection.

IV. *Man the final cause of the creation.*

The principal abuse which has been made of the doctrine of final causes, and which has been the most protested against, is that to which we have already alluded, and which consists in making man the centre and end of the creation, and in believing that all has been made for his use and con-

[1] Voltaire says very well on this subject: 'In order to become certain of the true end for which a cause acts, that effect must be at all times and in all places. There have not been vessels at all times and on all seas: thus it cannot be said that the ocean has been made for vessels. One feels how ridiculous it would be to allege that nature had wrought from the earliest times to adjust itself to our arbitrary inventions, which have all appeared so late; but it is very evident that if noses have not been made for spectacles, they have been for smelling, and that there have been noses ever since there have been men.' (*Dict. phil.*, art. 'Causes finales.')

venience.[1] Fenelon has often fallen into this extreme. He regards water as made 'in order to sustain those immense floating edifices which are called vessels. It not only quenches men's thirst, but also waters the dry fields. . . . The ocean, which seems placed between the continents to divide them for ever, is, on the contrary, the meeting-place of all nations; it is by this road that the Old World joins hands with the New, and that the New affords the Old so many commodities and riches.' Fenelon forgets that many centuries had to elapse before the ocean served as a road between the Old World and the New, and that when the trial of it was made, other defenders of Providence said that these unknown and perilous ways ought not to be faced. This too exclusively anthropological point of view was denounced by Descartes as anti-philosophical. 'Although it be,' says this philosopher, 'a pious and good thought as regards morals, to believe that God has made all things for us, to the end that that may stir us up the more to love and thank Him for so many benefits; although it be also true in some sense, because there is nothing created from which we cannot derive some use, . . . it is not at all probable that all things have been made for us, in such a way that God has had no other end in creating them; and it would be, as I think, to be impertinent to seek to use this opinion in support of reasonings in physics, for we cannot doubt that there are an infinity of things now in the world, or that there formerly were, though they may have entirely ceased to be, without any man having seen or known them, and which have never served him for any purpose.'[2] Descartes, as we see, only admits edification in one point of view; but as regards science, he sets aside this too easy explanation of things with reference to the con-

[1] This doctrine has indeed fallen into abeyance in modern philosophy since Descartes and Leibnitz. However, it still has defenders. We will mention, for example, as particularly interesting in this point of view, the work entitled *l'Homme et la creation, théorie des causes finales*, by Desdouits (Paris, 1834, 2d ed. 1846). Nowhere has the *anthropocentric* point of view been expressed in a more affirmative and decided manner.

[2] Descartes, *Principes de la philosophie*, iii. 3.

venience of man, this presumptuous pretence to refer all to ourselves. Goethe has criticised the same prejudice: 'Man is naturally disposed to consider himself as the centre and end of creation, and to regard all the beings that surround him as bound to subserve his personal profit. He takes possession of the animal and vegetable kingdoms, devours them, and glorifies that God whose fatherly bounty has prepared the festal board. He removes its milk from the cow, its honey from the bee, its wool from the sheep; and because he uses these animals for his profit, he imagines they have been created for his use. He cannot imagine that the least blade of grass is not there for him.' [1]

But no one has criticised this singular illusion regarding final causes in a more spirited and piquant manner than Montaigne, in a famous passage: 'Why should not a gosling say thus: All the parts of the universe regard me; the earth serves me for walking, the sun to give me light, the stars to inspire me with their influences. I have this use of the winds, that of the waters; there is nothing which this vault so favourably regards as me; I am the darling of nature. Does not man look after, lodge, and serve me? It is for me he sows and grinds: if he eat me, so does he his fellow-man as well; and so do I the worms that kill and eat him. . . . A crane could say as much, and still more magnificently, for the liberty of its flight, and for the possession of that high and beautiful region.' [2]

Doubtless, no philosopher will dispute the justice of the preceding observations, and in truth it is almost entirely in popular or religious writings that the prejudice in question

[1] Eckermann, *Gesprärhe mit Goethe*, t. ii. p. 282.

[2] *Essais*, ii. xii. He says again: 'Who has persuaded himself that this motion of the celestial vault, the eternal light of these lamps revolving so proudly above his head, the awful movements of this infinite sea, were established and are maintained so many ages for his convenience and service?' See again, for the same objection, Spinoza, *Ethics*, Book i. appendix; Buffon, *Histoire des animaux*, chap. i.; Biot, *Mélanges*, t. ii. p 7; Ch. Martins, *De l'unité organique* (*Revue des Deux Mondes*, 15 Juin 1862): and among the ancients, Cicero, *De naturâ Deorum*, lib. i. ix., Disc. of Velleius.

will be found especially developed. But it would be a grave error to believe that we have attained the doctrine of final causes by destroying or reducing to its just limits the doctrine of man the end of the creation.[1] Wherein, I ask, are these two conceptions bound together? Cannot I then believe, in a general manner, that God has proportioned in every being the means to the end, without affirming that all beings have been prepared for the use of one? Montaigne, doubtless, has the right to humble man by the ironical language he attributes to the goose, still we need only see in this the hyperbole permitted to satire, and not the exact expression of things. But it being true that the universe has neither been created for the use of the goose nor for that of man, does it follow that the organs of each have not been given them for their own use?

If we contemplate the immensity of the worlds, many of which are only known to us by the light they send us, and which takes ages to come to us, others of which have only been revealed to us since the invention of the telescope,—if we consider these two infinitudes of Pascal, between which man is suspended as a mean between nothing and all, it is absolutely untenable that all has been created for man. Even the earth is not entirely for his use. Let us add that the obstacles which he encounters there, the evils which nature opposes to him at every step, the noxious animals, maladies, etc., seem also to indicate that man has not been the exclusive object of the designs and previsions of Providence; and even if these means should be to him a trial, still they have not necessarily this end, since such beings exist where man has not yet gone, where it would be possible for him not to go if he chose: he could then put nature in default, and it would then have wrought in vain.

In place of saying that all has been created for the use of man, we must say that every being has been created for itself,

[1] Leibnitz, whose whole philosophy rests on the final cause, is one of those who have most contributed to uproot the prejudice in question.

each being having received the means necessary to support its own existence; and it is above all in this internal adaptation of the being that the principle of finality is displayed. In this point of view, nothing is more false than the conjecture of Lucretius and of Spinoza, reproduced by Goethe, namely, that man, having known how to satisfy his wants from external things, and having for this reason imagined that all has been made for his use, has thereupon applied this sort of reasoning to the organs even of animals, and to his own organs, and has concluded from them that these organs were means arranged for ends,—that the eye was made for seeing, the teeth for cutting, and the legs for walking. There is no need of such a circuit to perceive the adaptation of organs to their ends; and even supposing that in fact men had reasoned thus, which is scarcely probable, there is no reason to bind these two ideas together, namely, the personal utility for man of external things, and the respective utility of the organs and instincts for the animals themselves which are endued with them.

We cannot too much insist on the distinction established by Kant between *internal* finality, or the principle according to which each being is organized for its own preservation, and *relative* or *external* finality, according to which each being is only a means for the subsistence of another being. Each being is at first organized for itself, and in the second place it is subordinately fit for the subsistence of other beings. Man himself is not exempt from this law; and it could as well be said that he is made in order to feed worms, as it can be said that other animals are made to feed him: he is, therefore, himself a means as well as an end.

But after having insisted on this first principle, that each being is created for itself, it is evident that one cannot stop there; for it would follow that each being is an absolute whole, having no relation to other beings, each of which would equally form an absolute system. It must not be forgotten that each being forms part of the universe,—that is, of a more general system, of which it is only a member, and without

which it could not itself exist. This relation of the part to the whole proves to us that no organized being can be considered as a centre except relatively; each of these partial systems ought, therefore, to be co-ordinated to the whole and to each other, whence those reciprocal correlations, according to which all nature's beings are at once ends and means.[1] What is the part of man in this system? This is the question we have meanwhile to examine.

Every being requiring, in order to exist, 1st, An appropriate organization; 2d, Means of subsistence prepared apart from itself, may be considered, as we have seen above, as an end of nature in these two points of view;[2] nature has busied itself with it, and has made it one of the objects of its concern, by thus preparing, internally and externally, all that is necessary for it. By this title man is an end of nature, as well as the other creatures. Moreover, in proportion as a greater number of means are found disposed for the preservation of a being, or, what is the same thing, as the organization of a being has been made to enjoy a greater number of things, it may be said that the being thus privileged is a more important end for nature; so that a being has the right to measure its importance as a centre or end in the universe by the number of uses it can derive from the medium in which it lives, without, however, having ever the right to arrogate to itself the quality of last and absolute end. But who can deny that, of all creatures, man is the one most fitted to use external things, the one to whom the greatest number of things are co-ordinated in quality of means? and, consequently, why should not he have the right to believe himself the most important end of Providence, not in the universe taken as a whole, but relatively to the little corner of it which we know, and

[1] 'There is no being,' says Rousseau very well, 'which cannot in some respects be regarded as the centre of all the others, around which they are arranged, *so that they are all reciprocally ends and means relatively to each other.* The mind is confounded and loses itself in this infinitude of relations.' These expressions of Rousseau will be observed, which are precisely the same as those Kant afterwards applied to the definition of living beings.

[2] See previous chapter, p. 158.

that without in any manner affirming that even in that little corner all is made exclusively for him?

It is objected that this supposition, even thus reduced, will still lead to the most puerile and ridiculous consequences: all the artificial inventions of man will be considered as ends prepared by the goodness of Providence; that is, say they, but to confound the use with the end, and to refer to the first cause what is only the result of human reflection.

Fenelon has expressed this objection in these terms: 'I hear certain philosophers replying to me that all this discourse on the art displayed in nature is only a perpetual sophism. All nature, they will tell me, is for the use of man; it is true, but it is rashly concluded that it has been made with art for the use of man. . . . It is true that human industry makes use of an infinity of things with which nature furnishes it, . . . but nature has not made these things expressly for its convenience. For instance, villagers daily climb by certain pointed rocks to the summit of a mountain; yet it does not follow that these pointed rocks have been cut with art as a ladder for the convenience of men. So, too, when one is in the country during a storm, and meets with a cavern, one makes use of it as a house to take shelter; yet it is not true that this cavern has been expressly made to serve as a house for men. It is the same with the entire world. It has been formed by chance, and without design; but men, finding it such as it is, have had the skill to turn it to their uses.'[1]

It is, in effect, to abuse final causes even to include these sort of inventions among them—as, for instance, if it be said that the elasticity of steam exists in order that there may be railways. But yet once more, we must not confound artificial with natural inventions, like walking, sight, or nutrition. For it would be absurd to say that man, having found animals good to eat, has eaten them. There is here a necessary relation, which does not exist in the other case; and the preservation of man being attached to the satisfaction of this want,

[1] Fenelon, *Existence de Dieu*, 1re part. c. iii.

it is here not the mere result of reflection. For, first, it is a blind force, and not a reflecting industry, that leads him to the satisfaction of these wants; and, in the second place, there is a natural adaptation, anterior to all industry, in the organs themselves.

In a word, to recall what we have said in the previous chapter, the internal supposes an external finality, and the latter is only the reciprocal of the former. If man, according to his organization, is made to use things, these things reciprocally are made to be utilized by him. And in proportion as he uses and can use these things, he has the right to consider himself as being one of their ends. It is in this sense and measure that we must restrict the general proposition which has been abused, namely, that man is the end, if not of the creation, at least of the little world he inhabits.[1]

V. Objection of the Epicureans. *The effect for the cause.*

We now come to the knot of the question, to what may be called the objection of objections. The theory of final causes, it is said, inverts the order of the facts, and takes the effect for the cause: the eye sees, because it is capable of seeing; the bird flies, because it is capable of flying. Sight and flight are effects; the finalists make them causes. Lucretius, and before him Democritus, have expressed this objection with great precision:

> 'Istud in his rebus vitium vehementer, et istum
> Effugere errorem, vitareque præmeditator,
> Lumina ne facias oculorum clara creata,
> Prospicere ut possimus; et, ut proferre vias
> Proceros passus, ideo fastigia posse
> Surarum, ac feminum pedibus fundata plicari;
> Brachia tum porro validis et apta lacertis
> Esse; manusque datas utraque ex parte ministras;
> Ut facere ad vitam possimus, quæ foret usus.
>
> 'Cætera de genere hoc inter quæcumque pretantur;
> Omnia perversa præpostera sunt ratione.
> Nil ideo quoniam natum est in corpore ut uti
> Possemus, sed quod natum est id procreat usum.

[1] One can understand it, with Kant, in a much higher sense, by saying that the world only exists to be the theatre of morality.

Nec fuit ante videre oculorum lumina nata,
Nec dictis orare prius, quam lingua creata est,
Sed potius longe linguæ præcessit origo
Sermonem ; multoque creatæ sunt prius aures,
Quàm sonus est auditus ; et omnia denique membra
Ante fuere, ut opinor, eorum quàm foret ùsus,
Haud igitur potuere utendi crescere causa.

'At contra conferre manu certamina pugnæ,
Et lacerare artus, fœdareque membra cruore,
Ante fuit multo quàm lucida tela volarent.
Et volnus vitare prius natura coegit,
Quàm daret objectum parmai læva per artem.
Scilicet et fessum corpus mandare quieti
Multo antiquius est, quàm lecti mollia strata.
Et sedare sitius prius est, quàm pocula, natum.
Hæc igitur possunt utendi cognita causa
Credier, ex usu quæ sunt vitaque reperta
Illa quidem seorsum sunt omnia, quæ prius ipsa
Nata, dedère suæ post notitiam utilitatis.
Quo genere in primis sensus et membra videmus.
Quare etiam atque etiam procul est ut credere possis
Utilitatis ob officium potuisse creari.' [1]

'But before all, O Memmias, be on your guard against too common an error: believe not that the shining orb of our eyes has only been created to procure for us the sight of objects; that these legs and these moveable thighs have only been reared on the basis of the feet to give greater extent to our paces; that the arms, in fine, have only been formed of solid muscles, and terminated by the right and left hands, to be the ministers of our wants and of our preservation. By such interpretations the respective order of effects and causes has been reversed. Our members have not been made for our use, but we have made use of them because we have found them made. Sight has not preceded the eyes; the word has not been formed before the tongue—on the contrary, language has followed long after the origin of the organ; the ears existed long before sounds were heard, and all our members long before we made use of them. It is not, then, the view of our wants that has produced them.

'On the contrary, men fought with the fist, tore with the nails, were soiled with blood, long before the arrows flew

[1] Lucretius, lib. iv. 822, § 99.

through the air. Nature had taught man to avoid wounds before art had suspended a buckler on his left arm wherewith to shield himself. Sleep and rest are much older than the couch and down. Thirst was quenched before the invention of cups. All those discoveries, which are the consequences of want and the fruit of experience, we may believe to have been made for our use. But it is not so with objects whose use has only been found after their origin, such as our members and organs. Thus everything forbids us to think that they have been made for our use.'

Aristotle, recapitulating the same objection, already, to all appearance, made by the atomists, expounds it in a manner still more exact and profound than Lucretius: 'But here a doubt is raised. Why, it is said, may not nature act without having an end, and without seeking the best of things? Jupiter, for instance, does not send rain to develop and nourish the grain, but it rains by a necessary law; for in rising, the vapour must grow cool, and the cooled vapour becoming water, must necessarily fall. But if, this phenomenon taking place, the wheat profits by it to germinate and grow, it is a simple accident. And so again, if the grain which some one has put into the barn is destroyed in consequence of rain, it does not rain apparently in order to rot the grain, and it is a simple accident if it be lost. What hinders us from saying as well, that in nature the bodily organs themselves are subject to the same law, and that the teeth, for instance, necessarily grow—those in front incisive and capable of tearing food, and the molars large and fitted for grinding it, although it is not in order to this function that they have been made, and that this is only a simple coincidence? What hinders us from making the same remark for all the organs where there seems to be an end and a special destination?' [1]

It is easy to see that Lucretius has only reproduced the objection of Aristotle, while weakening it and adding to it

[1] *Physics*, lib. ii. chap. viii., Berlin edition, p. 198, B.

unphilosophical considerations. For to suppose, for instance, an interval between the origin of the organs and their use is very unreasonable. It is evident that the heart behoved to beat and the lungs to breathe as soon as they were produced; the mouth behoved to imbibe nourishment, and the members to take it, almost immediately after birth, otherwise the animal would not have lived. Besides, Lucretius improperly compares the use of the organs to artificial inventions, which are phenomena of quite a different kind. It is not at all in the same way that man makes use of the eye for seeing and of a stick for walking. The first is natural, the second artificial. Nobody maintains that the use of the organs is of the same kind as that of arms, furniture, or utensils of human industry. There is, on the contrary, a radical difference, entirely to the advantage of final causes. In the second case, in effect, it is man who himself applies to his use all the objects of nature; but in that, it is he who proposes an end to himself, and one may hesitate to say that nature has prepared these things for his use that he may derive benefit from them. On the other hand, the use of the organs is entirely natural. It is false and absurd to suppose that man, perceiving that the legs were good for walking, began to walk; or perceiving that the eyes were capable of seeing, began to see. There are even certain usages of our active life which have long appeared artificial results of our will, and which it is now agreed to consider as natural and spontaneous. Such are, for instance, language and society. Nobody now any longer believes that man invented language as he invented the plough. Those who said that language is necessary to explain the invention of language were right if they spoke of a thought-out invention; but it is not so. In all probability man has always spoken, as he has always lived in society. Thus this spontaneous and necessary use of our organs and faculties cannot be compared to the artificial use of the objects of nature. The argument of Lucretius, which rests on this comparison, would therefore fall with it. For what does he say? That if the

organs had been created for an end, that end must have already preceded the production of the organs, since, being the cause of that production, it ought as such to pre-exist. Thus men had already fought before creating arms for combat; so it seems that, for Lucretius, vision must have already existed somewhere before eyes were invented for seeing: that would only be true if man himself invented his eyes, which is absurd, or only invented the use of them, which is false. Besides, we can retort against Lucretius the principle he employs, for he seems to say that man has discovered the use of his eyes and his legs as he has discovered the use of arms or beds. But then he must in the first, as in the second case, have found a model; therefore, on his own hypothesis, sight must have preceded the eyes, and walking have preceded the legs. But, as that is absurd, it follows that the use of the eyes and legs is natural and not artificial.

Disengaging the objection of Lucretius from the complications which obscure and enfeeble it, there simply remains as the knot of the objection this fundamental difficulty, that the doctrine of the final cause inverts cause and effect—*omnia perversa præpostera sunt ratione*—which Spinoza has expressed in these terms: 'The first defect of the doctrine of final causes is to consider as cause what is effect, and *vice versâ*.' [1] But who does not see that this objection is none other than the very question itself? For, if there are final causes, the effect is no longer merely an effect, it is also a cause (at least so far as it is represented *à priori* in the efficient cause). The question, then, is just this, whether there are not effects which are at the same time causes; and that cannot be put forth as an objection which is precisely the object of debate. If mechanism is right, doubtless we shall have taken the effect for the cause; but if we are right, it is mechanism

[1] *Éthique*, 1re part, Appendix. Buffon has also said: 'Those who believe they can answer these questions by final causes do not perceive *that they take the effect for the cause*' (*History of Animals*, ch. i.). Descartes says, likewise: 'I mean to explain *effects by causes, and not causes by effects*' (*Principes*, iii. 4).

itself that will have done so. The objection, then, holds on both sides, or rather it holds on neither, for in either case it supposes what is disputed. In reality it is no longer an objection, but a doctrine,—the doctrine of mechanism, which we examined in the preceding chapter, and to which we do not need to revert.

Will it be said that it implies contradiction that an effect be a cause? and that a thing cannot act before existing? This is what we say ourselves, and therefore it is that we reduce finality to the foresight of the end. It is not the effect itself that is the cause; it is the idea of the effect. But this idea, in so far as it might determine the efficient cause, is anterior to its action. The objection thus would only hold against the hypothesis of an unintelligent and unconscious finality, which should be determined beforehand by an effect not existing and not represented. It would, therefore, only hold against a certain manner of understanding finality which is not ours, and the discussion of which we have hitherto postponed; but it is of no avail against the hypothesis of finality considered in itself.

Besides, this objection arises from not perceiving where is the real point of the question. In effect, it goes without saying that, a cause being given, such an effect must follow. 'Such an organ, such a function.' But the question is, how such an organ is found given. If we assume the existence of the eye, sight follows. But how comes it that the eye exists? There is the problem. All function is the solution of a problem, which consists in harmonizing the internal conditions of the organism with the external conditions of the physical medium. The harmony once found, the effect follows as a thing of course; but how the harmony has come about is not thereby resolved, but remains to be sought. The objection, then, does not occupy the true point of view, it does not touch the true problem; or rather it implies itself another objection, which we proceed to examine, namely, that the principle of final causes is nothing else than the principle of

the conditions of existence, according to which a thing exists when there meet together all the conditions that permit it to exist.

VI. Objection of Maupertuis. *The conditions of existence.*

The objection *non causa pro causâ*, which we have just discussed, implies, as we have just seen, that the organism itself is only an effect that results from certain given causes. What are these causes? We maintain that they can only be final causes. It is objected that final causes are useless, and that it is enough to appeal to the conditions of existence.[1] Let us see the difference between these two conceptions.

Aristotle, in the passage already quoted, expresses with precision the opposition of these two principles: 'Every time,' he says, 'that things are accidentally produced, as they would be produced in having an end, they subsist and are preserved, *because they have spontaneously taken the suitable condition; ἀπὸ τοῦ αὐτομάτου συστάντα ἐπιτηδείως*; but those in which it is otherwise have perished.'[2]

This objection (or rather this counter-position) has been reproduced by all the adversaries of final causes, and it is implied even in the negation of these causes. We have in Maupertuis a very clear *resumé* of this opinion.

'Might it not be said,' he writes, 'that in the fortuitous combination of the productions of nature, as it was only those in which certain relations of convenience were found that could exist, it is not wonderful that this convenience is found in all the species that actually exist? Chance, it might be said, had produced an innumerable multitude of individuals:

[1] The principle of the conditions of existence is not necessarily opposed to that of final causes. Cuvier even identifies them: 'Natural history has a principle which is peculiar to it, and which it employs with advantage on many occasions —that of the *conditions of existence*, commonly called *final causes*. As nothing can exist if it do not combine the conditions that render its existence possible, the different parts of each being must be co-ordinated so as to render possible the whole being, not only in itself, but in its relation to those that surround it, and the analysis of these conditions often leads to general laws as fully demonstrated as those derived from calculation or experiment.' (Cuvier, *Règne animal*, Introd.)

[2] See Aristotle, *Physics*, ii. chap. viii. 3.

a small number were found constructed so that the parts of the animal could satisfy their wants; in an infinitely greater number there was neither convenience nor order; all these last have perished. Animals without a mouth could not live; others without organs for generation could not be perpetuated. The only ones that have remained are those in which order and convenience were found, and those species which we now see are only the smaller part of what a blind destiny had produced.'[1]

This hypothesis of a groping of nature, and of a period of disordered parturition, said to have preceded rational productions such as we see them now, is contrary to all that we know of the processes of nature. No trace subsists of this period of chaos, and everything leads to the belief that, if nature had begun by chaos, it would never have come out of it.

It is impossible to dissemble the exorbitant part of chance in the previous hypothesis. Now chance, as we have seen, is nothing but the absence of a cause. The actual state of the animals is well explained, indeed, by the very fact of the existence of rational conditions rendering them possible; but what is the cause that has combined these rational conditions? All sorts of combinations, it is said, were possible, and have taken place; but among them were found some likely to live, and they alone have lived. Thus mere fortuitous encounters have produced living beings, and the principle of conditions of existence without final causes is nothing but chance.

Doubtless it would be wrong to wonder that works are not met with in nature which are *ipso facto* impossible—for instance, animals without organs of nutrition or generation (although, indeed, it is not evident why nature in its freaks, and in the countless arrangements of its elements, should not produce even now rough draughts of organisms, loose members, and, as Empedocles said, heads without bodies, bodies without heads, etc.). But without inquiring how far such rough

[1] *Cosmologie*, Works, t. i. p. 11.

draughts would be possible, on the hypothesis of a blind nature, I will grant, if you please, that there is no room for wonder that such specimens are not met with around us. But what gives cause for wonder is, not that beings incapable of living have not lived, but that beings capable of living are met with; for such beings might not have existed at all. No doubt, given organized beings, it is a thing of course that they should have appropriate organs, but that such beings should be given (which require such conditions), herein lies the difficulty. It is not enough to show that absurd arrangements are impossible; it would be necessary to prove that such reasonable arrangements (namely, those which exist) are necessary. This is by no means evident; for nature was able long to dispense with organized beings, and there was no reason why it should not dispense with them always. It still remains, then, to explain how a conflict of forces can at a given moment have brought about a result so complicated, and requiring so appropriate a mechanism, as life.

It is said that chance was quite able to produce all sorts of beings, and that among those beings they alone have survived that could survive. But it has never been explained how it is that beings are only produced at present where relations of convenience exist. They get out of this by explanations addressed to the imagination rather than the mind. The great matrix, it is said, was in its first state more malleable, flexible, and fit to take all sorts of forms; at present it is fixed, and in its sterility can now only reproduce types already produced. Is not this to say that nothing, absolutely nothing in experience warrants us to suppose that such things have ever happened? The very limitation of the number of actual species is a fact hard to explain, for it is strange that nature is found to have exactly attained and exhausted all its fecundity; and even when it had produced all that can reasonably subsist, one does not see why it should not continue to produce unformed draughts, and why it should have stopped in the course of its freaks and aberrations.

But it will be said, do we not see such aberrations daily produced, namely monsters? Nature clearly proves in such productions that it creates things as they happen, sometimes good, sometimes bad, sometimes fair, sometimes hideous, sometimes reasonable, sometimes absurd. In our view, the existence of monsters in no way proves the hypothesis of a groping of nature and of a primitive chaotic state having preceded the period of regular organization. In fact, monsters themselves suppose well-regulated organisms; they are only produced by generation, and none have ever been seen that were the immediate products of nature: there is no example of the spontaneous generation of monsters. Even those that are artificially produced always have, as the point of departure, the succession of normal beings. Hence it follows that monsters suppose normal beings; they are only the deviation from the ordinary laws of generation, therefore they are but an accident. The rule and the law here precede the exception. It cannot, consequently, be supposed that it was in consequence of an infinite number of accidents of this kind that the normal state at length one day was established. No doubt, this normal state once given, one can understand that by a conflict of causes deviations are produced, that is, congenital deformities; for deformities, as well as infirmities, maladies, and death, are only the results of the rencounter and conflict of physical and vital laws. But it would be to reverse the terms, and to make order of disorder, according to a famous expression, to consider monsters as the types of the primitive state, and normal beings as happy accidents.[1]

I am no more impressed with the argument drawn from fossil species, which, it is said, would give us the example of these gropings by which nature had progressively been raised, fossils being only in some sort the embryos of actual species.[2]

I have not to discuss this last theory; I leave that to the

[1] We shall revert farther on to the fact of monstrosities.

[2] We know that Agassiz has strongly insisted on the analogies of the fossils with actual embryos.

naturalists. Good sense, however, suggests at once an objection so natural, that I cannot believe that the theory in question is anything but a hyperbolical expression, and in some sort a metaphor. In effect, embryos do not reproduce themselves, but the fossil species reproduced themselves like our own. They had, therefore, an entire system of organs and of functions, that are awanting in actual embryos; hence a difference which is not small, and which must involve others. I leave aside the fact of intra-uterine life, or of incubation, to which actual embryos are subject, while in the fossil species individuals attained as in ours to an independent life. It seems, then, to be only by metaphor that fossil animals are considered as the embryos of actual species. I will say as much of the theory, strongly opposed by Cuvier, according to which all animals would be, as it were, arrests of development in relation to the typical, that is, the human form. Aristotle had already expressed the same thought in this famous aphorism: 'The animal is an unfinished man.'[1] As a metaphorical and hyperbolical expression, this is an admirable thought; as an exact theory, it is very disputable.

Whatever else may be in it, the scale of nature, in whatever manner understood, has nothing that lends itself to the interpretation they would wish to give it. No doubt the inferior species have imperfect forms in relation to the superior —it is better to have the wings of the bird than the flaps of reptiles, the brain of man than that of the oyster; and one can also believe that the fossil species were less endowed than those of the present; but more or less in the distribution of advantages and of forms does not at all imply an elaboration of chance in the formation of living beings. Every being that lives, being even thereby organized to live, be that life humble or powerful, contains relations of finality and design; between this being, however humble, and a purely fortuitous product, a freak of nature, there is already an abyss, and the latter can never have served as a transition to the former.

[1] *De Part. Anim.* IV. X.: Πάντα γάρ ἐστι τὰ ζῶα νανώδη τἄλλα παρὰ τὸν ἄνθρωπον.

In the polyp I see finality as well as in the vertebrates, and the tentacles by which it seizes its prey are as appropriate to their use as the claws of the tiger or the hand of man.

The progressive development of forms, far from being opposed to the theory of finality, is eminently favourable to it. What more simple and more rational law could have presided over creation than that of a progressive evolution, in virtue of which the world must have seen forms, more and more finished, successively appear? Will it be said that nature could have spared itself imperfect and coarse forms, and confined itself to perfect and finished ones? But to which will this quality be accorded? The highest of the animals are still inferior to man. Man alone, therefore, should have been created. But could he subsist if he were alone? And could the superior animals also without the inferior, and so on to the lowest steps of the scale? And besides, since all these creatures could be, why refuse them existence? The animal called the *sloth* appears to us to have sad enough conditions of existence; but if it can live under these conditions, why should it not take advantage of them? Poverty of organization is a thing entirely relative; and perhaps it was worth more that all the forms capable of enduring have been created, in order that there might be beings of all kinds,[1] than if nature had confined itself to the most perfect, even supposing that that were possible.

VII. Objections of Spinoza.—a. *Ignorance of causes.* b. *The less perfect taken for the more perfect.* c. *The motive of creation.* d. *The final cause in man.*

Of all philosophers, the one who has maintained the most learned and profound contest against the doctrine of final causes is Spinoza. Let us single out from that discussion

[1] Bossuet has expressed this admirably: 'It is a beautiful design to have been pleased to make all sorts of beings,—beings that had only extension, with all belonging to it, figure, motion, rest, all that depends on the proportion or disproportion of these things; beings that had only intellect, and all that is akin to so noble an operation, wisdom, reason, foresight, will, liberty, virtue; in fine, beings where all was united, and where an intelligent soul was found joined to a body.' (*Connaissance de Dieu*, iv. 1.)

the essential points of the debate. Separating all that is common to other philosophers, we find here several new difficulties: 1st, It is the ignorance of causes that has evoked the hypothesis of final causes; 2d, This hypothesis not only takes the effect for the cause, but the less perfect for the more perfect; 3d, It supposes a poor and indigent God, who has need of the world to enjoy His glory; 4th, Even in man, where it appears most warranted, it still confounds the effect with the cause.

a. 'All must agree that men are born ignorant of causes, and that a universal appetite, of which they are conscious, impels them to seek for what is useful to them. A first consequence of this principle is, that men believe themselves free. It results from it, in the second place, that men always act in order to an end, namely, their own convenience; whence it comes that for all possible actions they never seek to know any but the final causes, and as soon as they know them, they remain at rest, having no longer in the mind any motive for uncertainty. . . . Thus, when our adversaries consider the economy of the human body, they fall into a stupid amazement, and as they know not the causes of so marvellous an art, they conclude that it is not mechanical laws but a divine and supernatural industry that has formed this work, and has arranged the parts of it so as not to injure each other. This is why every one that seeks the true causes of miracles, and strives to comprehend natural things as a philosopher, is at once regarded as impious.'

We see that Spinoza explains the belief in final causes as he explains the belief in liberty, by ignorance of causes. When we act without knowing what determines us to act, we think ourselves the masters of our actions, and we say that we act freely. So when we do not know how nature acts, we suppose that it acts voluntarily, and in order to be useful to us.

Leaving aside human utility, which is by no means, as we have seen, an essential element of the notion of final cause, we allege that there is no equivalence between these two

terms, ignorance of causes and finality. In effect, every one knows that there is nothing more unknown than meteorological phenomena—science has made little progress regarding their causes and laws; yet this is precisely the domain where the final cause appears most absent (not for the vulgar, perhaps, but for the philosopher). The causes of the shooting stars have been long unknown—they are nearly so still; yet no philosopher has attached them to a system of finality. Ignorance can lead to superstition, and sees miracles everywhere. But we have said already, and cannot too often repeat, that final causes are not miracles; and it is a confusion far from philosophical to assimilate the doctrine of final causes with that of supernatural interventions. For the rest, this is a point to which we will return. Let it suffice us to say, that there are thousands of phenomena whose causes are unknown, and which are by no means, therefore, given as examples of finality. On the other hand, nothing is better known than the laws of sight; optics and physiology explain to us exactly how it takes place, and yet it is just here that finality shines forth. The objection of Spinoza rests upon the principle, already refuted, that physical causes exclude final causes, or reciprocally: this is what scientists believe. If, on the other hand, as we have seen, these two kinds of causes can and should be reconciled, the knowledge of physical causes does not exclude final causes; and, reciprocally, the hypothesis of final causes is not bound up with ignorance of physical causes.

b. 'The defect of this doctrine,' says Spinoza again, 'is to regard as cause what is effect, and, reciprocally, to take what is anterior for what is posterior' (objection of Lucretius, see above, iv.); 'in fine, *it reduces the more perfect to the less perfect.* In effect, to say nothing of the first two points, which are evident by themselves, it results from the propositions (xxi., xxii., xxiii.) that the most perfect effect is that which is produced immediately by God, and that an effect becomes more and more imperfect in proportion as its production supposes a greater number of intermediate causes. But if the things

which God immediately produces were made in order to attain an end, it would follow that those which God produces last would be the most perfect of all, the others having been made in order to these.'

This second objection belongs to the foundation of the doctrine of Spinoza. According to him, the type of perfection is God. He defines Him, with Descartes, as the infinitely perfect being. Like Descartes, too, he allows more perfection or reality to substance than to attribute, to the attribute than to the modes; and among the modes, more perfection to the *simple modes* derived immediately from the attributes, than to the *complex modes* which result from these simple modes. But what are called *ends* or *final causes* are effects—for instance, sight, in relation to the eye; life, with reference to the organized being; these are, therefore, complex modes, resulting from the combination of certain motions, which are the simple modes. In the system of final causes, the end is superior to the means, consequently the composite to the component elements, the ulterior to the anterior. This is contrary to the true order, according to Spinoza.

This objection, though one dare hardly say it of so great a logician, is nothing but a *petitio principii*. No doubt, if Spinoza is right, if there are only efficient and not final causes, the order of perfection goes from cause to effect, that is, descending. But if there are final causes, the order of perfection will be inverse, and will go from low to high, from effect to cause—in a word, will be ascending. But the question is just whether this order is ascending or descending. To lay down in principle that it must be descending, is to lay down what is in question. But, Spinoza will say, what is remote from God is necessarily less perfect than what is nearer Him. Is it not evident that this is still the question? If there are final causes, each end is a degree of perfection attained by nature, which rises gradually from the less to the more perfect. In this respect each of these degrees is, if you will, farther from God considered as cause, but it is nearer Him if

we consider Him as end. If we imagine the creation as a vast *circulus,* which goes from the perfect to the perfect, or from God to God, traversing all the possible degrees of finite existence, one cannot say that there is necessarily more perfection in the anterior than in the ulterior, for if power is on the one side, goodness is on the other. That an effect may be produced, no doubt there must be anterior causes, to which God communicates power; they are, therefore, in this more perfect than their effects, since they contain them. But that these powers may act, they must be determined by goodness to produce certain effects rather than others; in this respect the effect is better than the cause, since it determines its action.

Such an objection would only have all its force by supposing a nature existing of itself, without a supreme cause—a nature which, by its own powers, and without being directed in its movement, should rise spontaneously from the less to the more perfect—a nature which, consequently, must have set out from the minimum of existence (equivalent to 0) to seek a maximum of existence (equivalent to the absolute). Such a nature, in effect, would come under the objection of Spinoza;[1] but such a hypothesis is not ours, and is in no way bound up with the doctrine of final causes.

c. 'Add that this doctrine destroys the perfection of God; for if God acts for an end, He necessarily desires something which He lacks. And although theologians and metaphysicians distinguish between an end of *indigence* and an end of *assimilation,* they yet avow that God has made all for Himself, not for the things He was to create, seeing that it was impossible to allege, before creation, any other end for the action of God than God Himself; and in this way they are forced to admit that all the objects which God has set before Himself, by arranging certain means to attain them, God has at some time lacked, and has desired to possess them—a necessary consequence of their principles.'

[1] This hypothesis is that of Hegel, and that of the Pythagoreans and of Leusippus; ἐξ ἀτελῶν τὰ τελειότερα, says Aristotle (*Metaph.* xiv. 5).

This objection greatly transcends the sphere of our present discussion. The only point we have hitherto had to discuss is this: Are there final causes in nature? As to the *primary cause* of finality, and as to the *last end* of nature, we are warranted at present to dismiss these two problems. Because we might not know the supreme end of nature (or the motive of creation), it would not follow that we did not know the secondary ends; and though we might not know the first cause of finality, it would not follow that there was no finality. We shall elsewhere meet these questions again, but they do not bear on that which is the present point of discussion.

Let it suffice us to say, that the difficulty raised by Spinoza not only bears against the doctrine of final causes, but against his own doctrine; because, for whatever reason, God has come forth from Himself as well in pantheism as in creationism or intentionalism. Even by the doctrine of Spinoza, God would not therefore be perfect in Himself, since He needed self-development. The difficulty of the co-existence of the finite and the infinite exists in every doctrine without exception that admits both, which the Spinozists do as well as we. Schelling asked Hegel why the *Idea* had thought of going out of itself, and if it was *wearied* of the abstract state that it decided to pass to the concrete; and even he, in his last philosophy, when he admits a pure will that decays, tells us nothing much more satisfactory. As to the hypothesis that would explain nature as a power primordially undetermined, and which should progressively be developed by passing into action, we have just seen that it is precisely this hypothesis which lies open to the preceding objection.

d. 'That species of cause called final is nothing else than the human appetite, in so far as it is regarded as the principle, or the principal cause of a certain thing. For instance, when we say that the final cause of a house is to provide a dwelling, we mean thereby nothing more than this, that man, *having represented to himself* the advantages of the domestic life, *has had the desire* to build a house. Thus, then, this final cause

is nothing more than the particular desire just mentioned, which is indeed the efficient cause of the house; and this is for men the primary cause, for they are in common ignorant of the causes of their appetites.'

This analysis of the final cause contains, in fact, nothing that really contradicts it. No one maintains that the house itself as house is the cause of the structure. No one denies that the final cause may be reduced to the efficient cause, if in the efficient cause itself the final cause be introduced, namely, the desire and idea, in other words, the anticipation of the effect; and it matters little whether the cause, thus analyzed into its elements, is called final or efficient. The only question is, whether a house is produced without there having previously been an anticipatory representation of it; whether it has not had an ideal before having a concrete existence; and whether it is not the ideal that has determined and rendered possible the concrete existence? Hence the question, whether an analogous cause ought not to be supposed wherever we shall meet with similar effects, that is, co-ordinations of phenomena, themselves linked to a final determinate phenomenon. Such is the problem; the psychological analysis of Spinoza contains nothing that contradicts the solution we have given of it.

VIII. Positivist objection. *Supernatural interventions.*

I mean by the Positivist objection, that which consists in confounding the final cause with the supernatural; not that this confusion is exclusively peculiar to the Positivists, but they seem to me to have specially insisted on this difficulty. At all events, here we have it set forth with precision by M. Littré:

'It is to marks of design that reference is made in order to arrive at the first cause; but marks of design, perpetually renewed in the structure of the worlds, in the motion of the stars, in the adaptation of our planet, in the organization of living beings, such marks of design, I say, what else are they than marks of incessant intervention of the first cause.

Consequently, the principle of the Positivist philosophy is broken with, which repels interventions and only accepts laws.'[1]

Mr. Stuart Mill, however, who is quite as much entitled as M. Littré to speak in the name of the Positivist philosophy, for his part thinks, on the contrary, that there is no contradiction between the Positive method and final causes. Let us here set forth, although somewhat at length, his valuable testimony upon this question.

'It is proper,' says Mill, 'to begin by relieving the doctrine from a religious prejudice. The doctrine condemns all theological explanations, and replaces them, or thinks them destined to be replaced, by theories which take no account of anything but an ascertained order of phenomena. It is inferred that, if this change were completely accomplished, mankind would cease to refer the constitution of nature to an intelligent will, or to believe at all in a Creator and supreme Governor of the world. This supposition is the more natural, as M. Comte was avowedly of that opinion. He indeed disclaimed dogmatic atheism with some acrimony, and even says (in a later work, but the earliest contains nothing at variance with it) that the hypothesis of design has more probability than that of a blind mechanism;[2] but conjecture, founded on analogy, did not seem to him in a mature state of the human intelligence a sufficient basis to rest a theory on. He regarded all real knowledge of a commencement as inaccessible to us, and the inquiry into it an over-passing of the essential limits of our mental faculties; but those who accept the theory of progressive stages of opinion are not obliged to follow it so far. The Positive mode of thinking is not necessarily a negation of the supernatural; it merely throws back that question to the origin of all things. If the universe had a beginning, that beginning, by the very conditions of the case, was supernatural; the laws of nature cannot account for their own

[1] *Revue des Deux Mondes*, 15th August 1866.

[2] Where has M. Comte said this? We know not; and greatly regret that Mr. Mill has not exactly quoted the passage, which we have in vain sought in the *Système de politique positive*, the last work of Aug. Comte.

origin. The Positive philosopher is free to form his opinion on this subject conformably to the weight he attaches to the said marks of design. The value of these marks is indeed a question for the Positive philosophy, but it is not one on which Positive philosophers are necessarily agreed. It is one of M. Comte's mistakes, that he never allows of open questions. The Positive philosophy maintains, that within the limits of the existing order of the universe, or rather of the part which is known to us, the cause directly determinative of each phenomenon is natural, not supernatural. It is compatible with this principle to believe that the universe was created, and even that it is continually governed, by an Intelligence, provided we admit that the intelligent Governor adheres to fixed laws, which are only modified or counteracted by other laws of like operation, and which are never superseded in a capricious or providential manner. Whoever regards all events as parts of a constant order, each of these events being the invariable consequent of some antecedent condition or combination of conditions, fully accepts the Positive mode of thinking, whether or not he recognise a universal antecedent, whereof the whole system of nature was originally the consequent, and whether that universal antecedent be conceived as an Intelligence or not.'[1]

On this question we are entirely of Mr. Mill's opinion.

[1] Stuart Mill, *Auguste Comte and Positivism*, pp. 13–15. Let us further quote, in the same connection, the interesting testimony of Cabanis, *Lettre sur les causes premières*, p. 41 : 'It suffices to cast the most superficial glance on the organization of vegetables and animals, on the manner of their reproduction, development, and fulfilment, according to the spirit of this very organization, of the part assigned to them in the series of beings. The mind of man is not made to understand that all that takes place without foresight and end, without intelligence and will. No analogy, no probability, can conduct him to such a result; all, on the contrary, incline him to regard the works of nature as operations comparable to those of his own mind, in the production of works most skilfully combined, which only differ from them by a degree of perfection a thousandfold greater; whence arises for him the idea of a wisdom that has conceived and a will that has executed them,—but a wisdom the highest, and a will most attentive to all details, exercising the most extensive power with the most minute precision.

'It is not that we must always in researches on nature, or in philosophical discussions to which they give rise, adopt the vain and sterile explanations of final causes ; nothing, doubtless, is more fitted to quench and mislead the genius

The doctrine of final causes has nothing to do with the doctrine of supernatural interventions, in other words, with the doctrine of miracles. We have already several times indicated this point of view. This is the place to insist upon it, and to have done with this difficulty.

M. Littré here affirms, without demonstrating, what is just the question, namely, that the doctrine of finality demands an incessant intervention of the Creator in the series of natural phenomena. This is not at all evident, and it is even evident to us that there is no necessary connection between these two things. To be convinced of this, it is enough to observe one of the facts where finality is indisputable, namely, one of the combinations created by human industry. It will be seen that intelligence only intervenes at the beginning, and that the chain of phenomena then unrolls, according to physical laws, without any new intervention of the directing agent. If, for instance,—to take a very simple example,—I kindle a fire in my grate, I only intervene to produce and combine together the different agents whose natural action behoves to produce the effect I have need of; but the first step once taken, all the phenomena constituting combustion engender each other, conformably to their laws, without a new intervention of the agent; so that an observer who should study the series of these phenomena, without perceiving the first hand that had prepared all, could not seize that hand in any special act, and yet there is there a preconceived plan and combination.

of discovery, nothing more inevitably leads us to chimerical results, often as ridiculous as erroneous. But what is true in all researches, and in all discussions of detail, is so no longer when one is at the end of them, where we have by hypothesis supposed man to be; and when we reason on causes, or, if you will, on first causes, all these rules of probability force us to recognise them as *final*. Such, at least, is our mind's method of conceiving and proceeding; and its conclusions can only be opposed by subtle arguments, which, by that very fact, hardly seem that they can have been founded in reason, or by learned systems in which there always remain great gaps. But, certitude being by no means to be found in this last, the more one will take the *trouble to examine the motives* enounced by those that adopt it, the more, it seems to me, we will find ourselves invincibly driven, as it were, towards the first, which combines in its favour the strongest probabilities.'

In the controversy between Leibnitz and Clarke, the question was raised whether it would be more for the honour of a workman to make a work that would go quite alone, without having need of help or repair, or a work that the hand of the workman retouched from time to time. Clarke, starting from the idea of Newton (and that a false one), that the planetary world needs to be refitted from time to time by its Author, said that it was better that the work should bear the mark of its dependence, and that the divine Author should make His power and existence felt by personally appearing when it was necessary. Leibnitz maintained, on the other hand, that the abler a workman is, the more durable should his work be, and have in itself whereon to subsist. In our opinion Leibnitz is right; but because the workman should not have to interpose to repair or maintain his work, it does not follow that he did not interpose a first time by an initial act, which implicitly contained all ulterior manifestations.

It cannot, therefore, be said, taking matters in principle, that the doctrine of final causes demands incessant interventions of Providence. We must always recognise that on certain special points—for instance, the origin of life, the origin of living species—one seems almost forcibly driven to the miraculous intervention of the Deity, if we do not wish to lend ourselves to various hypotheses which attempt to reduce these diverse phenomena to known natural laws. But we reserve this difficulty for discussion in its own place. Suffice it here to point out that the idea of final cause, taken in general, and without examining this or that special problem, contains nothing contrary to the idea of a universal mechanism, ruled by natural laws, of which God might be the primary author, and which He might sustain by His general action without needing to interpose in each particular act.

For the rest, the Positive school appears to us less entitled than any other to dispute the incessant and universal intervention of the first cause in phenomena, since, strictly admitting only facts and relations, it knows not at all whether there are

second causes, distinct from the first, and having proper virtuality in them. Since there are empirically only facts and relations, and beyond, a vast unknown *noumenon*, who can tell that this is not the first and universal cause, which is the sole cause, and which immediately produces in a given order all the phenomena of the universe? And by what right could you affirm that, apart from this unique cause, there are second and subordinate causes that act under it? When you say that all these phenomena result from the properties of matter, what do you mean to say? What do you mean by matter? Matter and its properties are hidden causes which are not evident to experience. You only know phenomena and laws, you say. Very well. Beyond that you know nothing, then—matter no more than all the rest. There is, then, beyond all phenomena only an unknown cause, whose mode of action is unknown to you: you are no more at liberty to call it matter than we would be at liberty, if we reasoned according to your principles, to call it God.

According to M. Littré, the property of accommodating itself to ends—of *adjusting itself*, as he says—is one of the properties of organized matter. It is of the essence of this matter to adapt itself to ends, as it is of its essence to contract or expand, to move or to feel. One wonders to see a mind so familiar as that of M. Littré with the scientific method, so easily satisfied with words. Who does not recognise here one of those hidden qualities on which scholasticism lived, and which modern science everywhere tends to eliminate? [1] Let men but think of it, and they will own that there does not exist a sort of entity, called organized matter, endowed, one knows not why nor how, with the property of attaining ends; what really exists is a totality of solids, liquids, tissues, canals, hard parts, and soft parts—in a word, an incalculable totality of second causes and blind agents that all unite in a common action, which is life. What must be

[1] This is so true that another Positivist writer, M. Robin, has abandoned him on this point. (See above, chap. iv.)

explained is, how so many different causes know how to meet and produce this common action, this coincidence of so many divergent elements in a single effect. To say that this rencounter, this coincidence, is quite a simple thing, and is explained by an accommodating virtue in matter (for is not this what M. Littré calls the property of adjusting itself to ends ?), is to resuscitate the dormitive and other virtues of scholasticism. In another writing,[1] M. Littré had opposed with eloquent vivacity the *vis medicatrix* of the school of Hippocrates. Wherein is it more absurd to admit in matter the property of healing itself, than the property of adjusting itself to ends ?

IX. Objections of naturalists. *Exceptions.*

Natural history furnishes most of the reasons by which the theory of final causes is supported ; but it equally furnishes the objections. If the generality of the facts appears to agree with the law, the exceptions are numerous enough to deserve examination.

The theory rests on the strict adaptation of organ to function. But we have already seen that this adaptation, this absolute correspondence, fails in many cases. In effect, it often happens that the same organ fulfils several functions, and, reciprocally, that the same function is accomplished by different organs.

'Numerous cases could be given amongst the lower animals of the same organ performing at the same time wholly distinct functions. Thus the alimentary canal respires, digests, and excretes in the larva of the dragon-fly and in the fish cobitis. In the hydra, the animal may be turned inside out, like a glove, and the exterior surface will then digest and the stomach respire. . . . Again, in the animal kingdom, two distinct organs in the same individual may simultaneously perform the same function. To give one instance,—there are fish with gills or branchiæ, that breathe the air dissolved in the water at the same time that they breathe free air in their

[1] *Revue des Deux Mondes*, 15th April 1846.

swim-bladders, this latter organ being divided by highly vascular partitions, and having a *ductus pneumaticus* for the supply of air. . . . The illustration of the swim-bladder in fishes is a good one, because it shows us clearly the highly important fact that an organ originally constructed for one purpose, namely flotation, may be converted into one for a widely different purpose, namely respiration.' [1]

The tail, a nullity in man and in the anthropomorphoid apes, becomes prehensile and fulfils the office of a fifth hand in the American monkeys, the sarigua, and the chameleon, while it serves as basis, support, nay, as a foot, to the kangaroo and the jerboa. An organ is not, therefore, characterised by its use; for the same organ fulfils the most diverse parts, and, reciprocally, the same function can be fulfilled by very different organs. Thus, the nose and the tail may fulfil the office of the hand; the latter, in its turn, becomes a wing, an oar, or a fin. . . . The ostrich has wings that could not sustain it in the air, but which accelerate its pace; those of the penguin are fins; those of the cassowary and of the *apterix* of New Zealand are so undeveloped that they are of no use whatever. [2]

We willingly admit that there is not an absolute and necessary correlation between organ and function. It is by starting from this false hypothesis, says Milne-Edwards,[3] that the mistake has been made of denying to certain animals certain properties, in default of finding in them the organs that one is accustomed to see correspond to these properties. For instance, Lamark denies sensation to polyps, infusoria, and worms, and intelligence to insects, because in none of them is found a brain, an organ necessary for these two functions in the superior animals. The circulation in insects has also been denied, in default of finding veins and arteries in them; but a profounder study of facts shows us that the function

[1] Darwin, *Origin of Species*, 5th ed., pp. 227, 228.
[2] Ch. Martins, *De l'unité organique* (*Rev. des Deux Mondes*, 15th June 1862).
[3] *Introduction à la zoologie générale*, chap. iv.

does not always disappear with the organ destined to accomplish it. 'Nature arrives at the desired result in several ways.'

But we have seen[1] that it is not at all by chance that these various adaptations are made, whether of a single organ to several functions, or of several different organs to one and the same function. It is in virtue of a law or tendency, a law perfectly rational and quite similar to that which directs human art, and which Milne-Edwards has called *the law of economy.* He expresses himself thus on this subject: 'When a physiological property . . . begins to be realized in a series of animals more and more perfect, it is at first exercised with the help of a part that already existed in the organism of the inferior species, and which is only modified in its structure to be adapted to its special functions. Sometimes it is, so to say, a common fund that furnishes to the different faculties their first special instruments; at other times it is a system already destined to special uses from which the new function borrows its organs; and it is only after having exhausted the resources of this kind that the creative power introduces into the constitution of beings with organization still more perfect a new element.'[2]

One can perfectly understand, in the light of these facts, how the relation of organ and function is not the absolute, strict relation that one is at first inclined to suppose. So long as one and the same means may suffice, with certain modifications, it is quite natural that nature should employ it, and no industry would act otherwise. On the other hand, when new conditions complicate the difficulty of a function, it is no wonder that different means are employed for one and the same act. Thus, the gills are in no way the analogue of the lungs, although they fulfil the same functions, just as horses are not the analogue of ships, although they fulfil similar functions. In fine, we can thus understand even

[1] See chap. iii.

[2] Milne-Edwards, *Introduction à la zoologie générale*, chap. iv.

organs without function. For that certain pieces of the organism have ceased to serve is no reason why they should entirely disappear. The law of economy is only a particular application of the metaphysical principle of the *simplicity of ways*, appealed to by Malebranche, or of the mathematical principle of the *least action*, defended by Euler and Maupertuis.

We have just spoken of organs without function. This is a matter on which it is important to insist, for it is one of those that have been most appealed to against final causes.

The organs that are useless, whether really or apparently, are of two kinds. Some are complete organs, entirely like the others, with this difference, that they seem of no use. The others are incomplete organs, incapable of acting from their very insufficiency, and which, for this reason, are called *rudimentary*.

A. *Useless organs.*—The first are few in number in the present state of science. Almost all known organs have their proper functions; only a few oppose this law. The chief of these organs in the higher animals is the *spleen.* It seems, in effect, that this organ does not play a very important part in the animal economy, for numerous experiments prove that it can be extirpated without seriously endangering the life of the animal. We must not, however, conclude from this that the spleen has no functions; and physiologists do not draw this conclusion from it, for they are seeking them, and are not without hope of finding them.[1] An organ may be of service without being absolutely necessary to life. Everything leads to the belief that the spleen is only a secondary organ; but the existence of subordinate, auxiliary, or subsidiary organs involves nothing contrary to the doctrine of finality.[2]

[1] See *Recherches sur les fonctions de la rate*, by MM. Malarret and Picard (*Comptes rendus de l'Ac. des Sciences*, 21st Dec. 1874 and 22d Nov. 1875).

[2] We must also add to the organs whose function is not known, the *suprarenal capsules*, the *thyroid*, and the *thymus*. In the case of these different organs we can reply, as in that of the spleen, that because we do not know their function,

Darwin, on this point, comes to our aid, for in his system it is as necessary to prove the utility of the smallest organs as in the teleologic system. 'We are much too ignorant,' he says, 'regarding the whole economy of any one organic being to say what slight modifications would be of importance or not. . . . The tail of the giraffe, for instance, looks like an artificially-constructed fly-flapper, and it seems at first incredible that it has been adapted for its present purpose for so trifling an object as to drive away flies. Yet we should pause before being too positive even in this case; for we know that in South America the geographical distribution and existence of cattle and other animals absolutely depend on their greater or less power to resist the attacks of insects, so that individuals which could by any means defend themselves from these small enemies might spread into new pastures, and thus gain a perpetual advantage over rival varieties. It is not that our present great quadrupeds are actually destroyed by flies, but they are constantly harassed and exhausted, so that they become more subject to disease, or less capable, in case of dearth, of seeking their food and of escaping beasts of prey.'[1]

The same is the case with characteristics the most superficial in appearance—colour, for instance. 'When we see,' says Darwin, 'leaf-eating insects affecting a green colour, others which feed on bark a dappled grey, the Alpine ptarmigan (snow partridge) white in winter, the red grouse the colour of heather, and the black landrail the colour of peat, we must believe that these particular shades are useful to these species, protecting them against certain dangers.'[2]

If characteristics so superficial as colour may be of great use to the animal, we need be in no haste to affirm that this or that organ is absolutely useless. Thus, in all the preceding cases

we must not conclude that they have none. As to the last of these organs, everything leads to the belief that it is a fœtal organ, or, at least, relates to the functions of early infancy, for it usually disappears at the period of puberty.

[1] Darwin, chap. vi. § 6, pp. 239, 240.

[2] *Ibid.* chap. iv. § 2, p. 97.

the explanation derived from our ignorance appeared sufficient; and we may have recourse to it as well, for example, as astronomers might, for the apparent exceptions that contradicted Newton's law. The law of the utility of organs and of their adaptation being verified in an infinite number of cases, it would be far from reasonable to call it in question because it failed in some particular instances, for it seems probable that it is rather our science than nature that is at fault.

B. *Rudimentary organs.*—However, if it may be maintained with advantage that in many cases the uselessness of organs is only apparent, and is explained by our ignorance, it is not so when the organs, by their very structure, evidently manifest their own uselessness. This is the case in the organs called *rudimentary*, the number of which is considerable, and which seem to be the stumbling-stone of finality.

Here are examples: 'The woman bears on her bosom the two breasts destined to nourish the new-born child; in the man the breasts are not developed, but the two nipples exist. Many mammifers, horses especially, can shake their skin, and thus drive away the flies that trouble them. There is a membranous muscle attached to the skin that shakes it thus. This muscle is not awanting in man,—it extends along the neck,—but is without use; we have not even the power to contract it voluntarily, and it is therefore useless as a muscle. The mammifers called marsupials, such as the kangaroos, the sariguas, the thylacines,—in a word, all the quadrupeds of Australia,—are furnished with a pouch, situated before the abdomen, where the young live during the period of lactation: this pouch is supported by two bones and closed by muscles. Although placed at the other extremity of the scale of mammifers, man bears, and behoved to bear, the trace of this arrangement, which, with him, is of no use. The processes of the *pubis* represent the marsupial bones, and the pyramidal muscles those which close the pouch of the kangaroo and sarigua. In us they are evidently without use. Another

example: The calf of the leg is formed by two powerful muscles, called the twins, which are inserted in the heel by means of the *tendo Achillis;* by the side of them is found another long, slender muscle, incapable of energetic action, called by anatomists the slender plantary. This muscle, having the same attachments as the twins, produces exactly the effect of a fine thread of cotton if joined to a thick ship's cable. In man, then, this muscle is useless; but in the cat, and other animals of the same kind, the tiger, the panther, and the leopard, this muscle is as strong as the twins, and helps to enable these animals to execute the prodigious leaps which they make to seize their prey. Useless to man, this muscle is thus very useful to the animals of which we speak.'

'Here is an example still more significant. In the herbivorous animals, the horse, the ox, and certain rodents, the great intestine presents a vast fold in the form of a *cul-de-sac,* called the cœcum. In man this fold does not exist, but is represented by a little appendix, which, from its shape and length, has been called the vermiform appendix. Digested food cannot penetrate into this narrow appendix, which is therefore useless; but if, unhappily, a hard body, such as a fruit-stone or a fragment of bone, finds its way into it, there results at first an inflammation, then the perforation of the intestinal canal, accidents followed by almost certain death. Thus we are the bearers of an organ not only without use, but which may become a serious danger. Indifferent to individuals, nature abandons them to all the chances of destruction; its solicitude does not extend beyond the species, the perpetuity of which it has otherwise secured.' [1]

Darwin, again, mentions the following examples:—

'I presume we may consider the "bastard-wing" of some birds as a digit in the rudimentary state; in a great number of serpents one of the lobes of the lungs is rudimentary, in others there exist rudiments of the pelvis and of the posterior

[1] Ch. Martins, *De l'unité organique* (*Rev. des Deux Mondes,* 15th June 1861).

members. We may mention the teeth observed in the fœtus of whales, and those whose existence is proved in young calves before their birth, and which even pierce the gums. I have even been assured, on weighty testimony, that rudiments of teeth might be discovered in the embryos of certain birds. Nothing seems simpler than that wings are formed for flight, and yet many insects have their wings so atrophied that they are incapable of acting, and not rarely they are enclosed under sheaths firmly fastened together.'[1]

The facts we have just mentioned are incontestable; many others might probably be mentioned. But what is the signification of these facts? That is the question.

There are only two known explanations of the rudimentary organs: either the theory of the unity of type of Geoffroy Saint Hilaire, or the theory of the atrophy of the organs by default of habit of Lamarck and Darwin. But neither of these two explanations contradicts the theory of finality. We have seen, in fact, that there are two sorts of finality,—that of use, and that of plan. It is by no means implied in the theory that the second should necessarily be sacrificed or even subordinated to the first. The type remaining the same, one can understand that nature, whether by amplifying it, by inverting it, or by changing its proportions, variously adapts it according to different circumstances, and that the organs, in these circumstances rendered useless, are now only a souvenir of the primitive plan,—not certainly that nature expressly creates useless organs, as an architect makes false windows from love of symmetry, but, the type being given, and being modified according to predetermined laws, it is not wonderful that some vestiges of it remain intractable to finality.

As regards the second explanation, it can equally be reconciled with our doctrine; for if the organs have ceased to serve, and have thereby been reduced to a minimum, which is now only the remains of a previous state, it does not follow that they cannot have been of use at a former time, and

[1] Darwin, chap. xiii. § 10, p. 535.

nothing conforms more to the theory of finality than the gradual disappearance of useless complications.

C. *Apparent and hurtful adaptations.*[1]—The uselessness, real or apparent, of organs, may thus be explained,—sometimes by our ignorance, sometimes by laws of structure that escape us. But is it so when we encounter in beings adaptations perfectly distinct, and which yet serve for nothing, or even, what is still graver, adaptations hurtful to the very being furnished with them? Here are some examples:—

'A trailing palm tree, of the Malay Archipelago, creeps to the summit of the highest trees by means of hooks admirably made, which are arranged round the ends of the branches. This peculiarity of organization is doubtless of the greatest use to the plant; but as very similar hooks are observed in several plants, which are not at all creepers, those that are observed in this species may have been produced in virtue of laws of growth as yet unknown, and have only afterwards proved useful to its representatives.'

'Does it not seem quite natural that the long feet of the waders have been given to them to inhabit the marshes, and to walk on islets of floating plants? Yet the moor-hen is almost as aquatic as the coot, and the water-rat almost as terrestrial as the quail or the partridge. In such cases—and many others analogous could have been found—the habits have changed without corresponding changes in the organism. We may consider the webbed feet of the Magellan goose as having become rudimentary in function and not in structure; and the deeply crescent-shaped membrane extending between the four toes of the frigate-bird shows that that organ is in process of being modified.'

'No more striking and complete adaptation of structure to habits could be found than in the woodpecker, so well fashioned for creeping around trees and seizing insects in the chinks of their bark. Yet in North America woodpeckers are found living entirely on fruits, and others, provided with long

[1] The following facts are borrowed from Darwin, chap. vi.

wings, which pursue insects by flight. In the plains of La Plata, where not a single tree grows, there lives a woodpecker which, like the others, has two toes before and two behind, the tongue prolonged and pointed, and the tail feathers sharp and stiff. . . . In fine, its beak is straight and strong, and can enable it to perforate wood.

'So with regard to the water merle, the most acute observer could not suspect, by examining its body, its sub-aquatic habits. Yet this abnormal member of the wholly terrestrial family of the merles only feeds by diving, catching at the stones with its feet, and using its wings under water.

'What more simple than that the webbed feet of geese and ducks have been formed for swimming? And yet there are several species of geese which have webbed feet like the others, but which only go rarely or never at all into the water.

'Can we consider the sting of the wasp or bee perfect, when, thanks to the barbs with which it is armed, these insects cannot withdraw it from the body of their enemy, so that they can only escape by tearing their viscera, thus inevitably causing their own death?

'Can we admire the creation of thousands of drones, entirely useless to the community of bees, and which, in the end, only seem to have been born to be fed by their laborious but sterile sisters? Can we admire the savage and instinctive hatred which impels the queen bee to destroy the young queens, her daughters, as soon as they are born, or to perish herself in the combat? . . . In fine, can we regard it as an ingenious and perfect combination, that our firs yearly elaborate clouds of useless pollen, merely in order that some of its granules may be borne at the pleasure of the breeze upon the seeds which they fertilize?'

It is the same among vegetables. 'It is affirmed that the calyx and the corolla are the protecting organs of the stamens and the pistil; that they secure fecundation, because the rain bursts the grains of pollen as far as they escape from the

anther, and thus produces the abortion of the fruit and grain. But, in the first place, a great number of plants are deprived of the corolla and even of the calyx. These envelopes, when they exist, do not always effectually protect the stamens and pistil against the rain. I may mention roses, lilies, tulips, the ranunculus, cistus, etc. This protection is really efficacious only in the campanulas, where fecundation takes place before the corolla expands. This genus only embraces useless plants, and, by an antithesis difficult to understand, the vegetables most necessary for man—those on which, so to say, the existence of the human race depends, namely, the cereals, rice, maize, the vine, the fruit trees—have flowers whose stamens are in no way protected against the weather. In fine, the calyx and corolla can be cut off before the expansion of the flower, and fecundation still takes place.' [1]

As regards this third class of facts, we will not dissemble the embarrassment one may be in to explain them from the point of view of the theory of final causes, if they are considered separately and one after the other. However, before appealing to a general theory which may embrace the whole of these facts and all those preceding, let us invoke some extenuating considerations. First, some of them are imperfect final causes, if you will, but not none at all. For instance, the convoluted horns of rams are less favourable defences than the straight horns of bulls, but they are still defences. The sting of the bee may bring about its death; [2] but it is a defence for the community: in this respect it is not absolutely useless. In other cases the utility is evident, only the circum-

[1] Martins—article quoted.

[2] Is this fact quite proved for every case? I am assured that when the bee does not remove too precipitately, it can fly without leaving its sting in the wound of its enemy. In general, each of the alleged facts would need to be separately studied by naturalists. The sad condition of the *sloth*, for instance, has been much lamented; but 'it is now known that this sluggish animal (the *sloth*), whose lot appeared to Buffon so deserving of compassion, leads a life no more unhappy than the stag of our forests. True, its limbs are not adapted for running; but they serve conveniently to carry it over the branches where it finds its food, and to support it there as long as is necessary' (*Mag. Pittoresque*, 1834, p. 477).

stances may have changed. The woodpecker, we are told, is made to climb trees, and that in a country where there are no trees. But it is not proved that there never have been any there. Here, then, there would be an adaptation that had become useless by a change of circumstances—it would not be absolutely none. The corolla and calyx imperfectly protect flowers, but still they protect them in a measure, and in certain cases in a very satisfactory manner. There are certain aquatic animals that have not webbed feet: it does not follow that what they lack is not very useful to those that have them; the others have other means that supply them. The faculty of articulation in parrots is not, I admit, of much use to them; yet it is related to what may be called the domestic faculties of animals, which render them fit to become the companions of man; and it cannot be denied that one of the ends of nature (not the only end) is to put man in immediate relation to certain species of them. In fine, the abundance of lost seed clearly proves, if you will, the indifference of nature for the individual in the lower species, but does not prove that it is indifferent to life in general. 'Nature is prodigal,' a great writer has said, 'because it is rich, not because it is foolish.' [1]

However, instead of these explanations of detail, which may still leave many doubts in the mind, there is a more philosophical and general reply, embracing not only the cases we have mentioned, but also all analogous facts, and all that can be called the disorders of nature.

Those who maintain that there are final causes in nature are not thereby bound to maintain that there are only such, and that they must always and everywhere prevail over efficient causes. Organized beings are not the only ones that exist; and they only exist on condition of being co-ordinated to certain media, of submitting to certain forces, which, considered generally, are in harmony with the destination of these beings, but which may sometimes be less favourable to them and to

[1] G. Sand, *Lettres sur la botanique* (*Revue des Deux Mondes*, 1868).

a certain extent contrary. Not only is nature in itself not bound to accommodate itself in all things, and for all circumstances, to the private convenience or utility of living beings, but even the structure of living beings is not founded only and exclusively on the idea of finality. There are efficient causes there too, acting conformably to their nature when nothing useful to the living being would result, or even when some particular inconvenience would result; there, too, there are general laws that may accidentally oppose what the law of finality, understood as an exclusive and absolute rule, would seem to require. The organization may be considered as a mean taken between the interest of the organized being, which would have such a structure, and the general laws of causes and effects that render that structure possible—a result of mechanism and finality. But it is impossible for the spectator who cannot have witnessed the interior elaboration of the universe—he cannot, I say, absolutely determine wherein this result, this mean, must consist in every particular case. To follow thus the detail of ends in their relation to causes, we would have had to be in the secret of creation; there are cases where we can, but we cannot do so always.

There is nothing in this conflict of final and efficient causes that should surprise us, if we reflect that nothing can exist, neither creature nor creator, without having a determinate essence, and that the essence of each thing only allows of a certain number of possible phenomena. No doubt the series of phenomena that results from a determinate essence is not an iron chain that can only be developed in a certain given direction, as we have already said, and as is proved by the diverse forms we can give to natural things; but although a certain deviation is possible in the development of phenomena, that deviation is necessarily confined within certain limits, but for which we would have to say that from any cause any phenomenon may result. But a cause that did not by its nature exclude any phenomenon, could only be an absolutely indeterminate cause—that is to say, a mere

chance, a mere nothing; it would thus be no cause at all. No cause is a cause except on condition of being something, of being a ποιόν τι; whence the consequence is inevitable that it cannot lend itself to every possible combination, and that every system of ends must necessarily be co-ordinated to the necessities and limits which will result from the employment of such efficient causes. And this consequence is not to be avoided by saying that other causes—that is, other means—should have been employed; for what we have said is true of all causes without exception. None of them can contribute to a combination of ends but within the limit of their constitution and their essence; all of them, consequently, might always oppose some resistance to the accomplishment of this or that aim; and to affirm that the means that have been employed are not the best possible,—that is, those best adapted to the ends,—we would need to compare what is with what might have been, a thing for us absolutely impossible.

One is generally tempted to consider life as a kind of miracle subsisting in the midst of a foreign nature, by the supernatural act of a personal will that maintains it while it pleases, and abandons it at pleasure, as, in an absolute government, the prince raises from nothing or casts down to it the object of his favours. This kind of anthropomorphism has the inconvenience of accumulating on Providence a responsibility for every moment, and would force us to attribute to a precise act of foresight all accidents that disturb order in the physical and the moral world. But, relatively to the organized being, this conception is quite arbitrary; it is not at all, according to Spinoza's expression, an *imperium in imperio:* it is bound in every way to external causes. All the laws of the physical and mechanical world are accomplished in it, as well as outside of it; it is by a just and marvellous combination of these laws with the organized being that life is possible. If this agreement cease, it is quite natural that life should cease, or be troubled at its source.

I do not require here to examine the possibility of miracles;

but it is evident that one has no right to require that nature should be continually occupied in working them. That Providence intervenes in a special manner when it judges proper is possible,—and we will neither affirm nor deny it,—but it is certain that it is more suitable to the Author of things to act according to general laws, than to intervene in each particular case. To suppose that each fact is the result of an immediate volition of God, is simply to suppress all second causes. If there are second causes, they act according to their nature, and always in the same way in the same circumstances, which is what we call laws. When the action of these laws becomes prejudicial or useless to the organized being, must God personally intervene to divert its causes, and to substitute for them an immediate personal action? One is surprised that certain phenomena, which have an end in the normal state, continue to be performed in other circumstances with evil effect, although they have become aimless.[1] For instance, the law of growth of organized beings, which applies to all the organs, continues to apply when these organs are

[1] Vulpian, *Phys. du syst. nerveux*, leç. xiv.: 'The tendency to restoration is manifested in the separated parts of the whole, as well as when they are in their normal relations. . . . You transplant a shred of the periosteum. There occurs, as M. Ollier has shown, not a mere calcification, but a true ossification, with all its characteristics. What useful end is gained by this ossification? Would it not have been more for the good of the individual that this transplanted shred should disappear by molecular resorbtion? You transplant a nerve. After deteriorating it recovers. What end can be served by this fragment of nerve, henceforth deprived of all relation to the nervous centre? Why does it anew acquire an excitability that can no longer be put in operation? . . . Why do grafts succeed, such as the engrafting of a cock's spur in its own comb or in that of another of the same species, or of the tail or paw of a rat under the skin of another rat? Why does the growth of that paw or tail take place in so regular a manner and stop at a predetermined period? Who does not see that here there is no foresight of an end to be attained, and that the phenomena only require, in order to be manifested, and that hurtfully, in following a necessary course, the conditions which render life possible? These conditions are furnished by grafting in certain cases; and in other cases, of nerves restored upon the spot, they have only been momentarily disturbed.' These objections of M. Vulpian are rather directed against the doctrine of the *vital principle* than against *final causes*. How far they avail in the first case we do not inquire. For us it suffices that they do not touch the principle of finality.

transplanted to the body of another animal, which is called *animal engrafting*. But was it needful, then, that God should take precautions for the case that an ingenious physiologist might think fit to transplant the tail of one rat under the skin of another?

The existence of monsters appears one of the gravest contradictions given by nature to the theory of final causes. Do not those beings, made in an extravagant way, in opposition to their end, and which are either unfit to live or called to a life the most incomplete, most abnormal, and most opposed to the essence of their species—do they not seem the product of a blind nature, acting by chance, and for which disorder is as natural as order? Are not these beings, of a structure so far from reasonable, still just like the regular beings, arranged in classes, genera, species, forming a sort of teratological order by the side of the normal order, and by the same right? Does it not seem, as Empedocles said, that nature has made all sorts of beings,—'oxen with human heads, and men with heads of oxen,' *βουγενῆ ἀνδρόπρωρα, ἀνδροφύη βούκρανα*,—and that the only beings that have survived are those that have been found capable of living?

However striking and startling to the imagination monstrous births may be, we do not believe that we have here a fact differing in nature from all the accidental deviations that external causes may produce in their conflict with vital laws. Granted that organized beings are called to live in a medium constituted by agents purely physical, it cannot be required that these physical agents should suspend at every instant the action of the laws that rule them, to subserve the particular interest of each moment of the organized beings of the universe. This would be to demand that there should be no laws of nature, and no theory of finality is committed to that. This posited, all the rest follows; and congenital deformities are no more extraordinary than those that are acquired. No one wonders that a man falls and breaks his leg, and that that leg, badly set, becoming shorter than the other, the man should be

lame. Why should it not be the same in the mother's womb? Why should not some unknown physical or physiological action accidentally produce internal disorders—for instance, some disarrangement of the parts, some suppression of organs—that will render life impossible or incomplete? The phenomenon only appears extraordinary to us, because for us the being only commences to live when it comes forth; but it was living before, and hence it may have been infirm or sick before its birth. If an infant, newly born, may have convulsions, why should it not have them before birth? and if it can be born dead, why should it not be born sick or deformed? On this ground, monsters no more afford an objection to final causes than all the other anomalies which we have discussed. They are all solved by a general principle,—namely, that finality is only a mean or a compromise between the proper interest of each living being and the general conditions of stability which the preservation of the universe demands.

As to the pretended parity existing between monsters and normal beings,—as if nature, at haphazard, cast both upon the surface of the globe,—it has already been refuted above, and is contradicted by all the facts. Monsters, in effect, are of a rarity not to be explained on the hypothesis of a nature absolutely indifferent between order and disorder. Besides, even if an equality of cases existed, it would be inexplicable, for in the domain of chance, order ought to be an accident and a rarity, and disorder the law. What proves that the production of monstrosities is owing in a great measure to the action of the medium, is the very means employed to produce them artificially. To obtain anomalies, and often monstrosities, says the learned teratologist, M. Camille Dareste, four processes may be employed: 'A vertical position of the eggs; the diminution of the porosity of the shell by applications more or less impermeable to the air; the contact of the egg with a source of heat at a point near the ceratricule, but not coinciding with it; in fine, the employment of temperatures a little lower or higher than

that of normal incubation.[1] By means of the two first processes the evolution is often modified; it is so always.' We thus see how small a thing suffices to disturb the regular evolution of the germ, and how the organizing and conservative force must prevail over the contrary force, in order to triumph in the majority of cases over so many disturbing causes.

In fine, as to the teratological classifications, which seem to establish a certain order in the domain of disorder, they in no way prove that monsters exist by the same right as normal beings, and that they might be considered as forming a world co-ordinated thereto. They are only, in reality, deviated individuals, and not a kingdom apart; and if they afford room for classifications, it is still the normal state that here serves as criterion and type, for it is by starting from the normal organs of the species, and from their natural situation, that we succeed in classifying all the species of disorders that can be produced.

It will be asked, whether there is anything that can be, strictly speaking, called the *normal state*,—whether there is a class embracing those beings born capable of living, and that might be called natural, and another class contrary to nature, and embracing the monsters? Aristotle has rightly said that 'monsters are not against nature in general, but against what occurs oftenest.' Montaigne expresses the same idea in magnificent terms: 'Do not what we call monsters belong to God? . . . By all His wisdom He produces nothing but what is good and regulated, but we do not see their assortment and relation. . . . We call what happens contrary to custom, contrary to nature. There is nothing but what is according to it, whatever it be.'[2] It is only in appearance, then, that

[1] *Mémoire sur la tératologie expérimentale*, chap. i.

[2] *Essays*, lib. ii. chap. 30. The learned teratologist, M. Camille Dareste, writes to the same effect: 'In reality, *there are no monsters*. This result I derive from all the labours of the teratologists, and particularly of the two MM. Geoffroy Saint Hilaire, as well as from all my own studies. I have seen formed almost all the types described by teratology, and I can see in monstrosity nothing but a modification of development, most frequently an arrest produced by an accidental cause. In these new conditions the development continues so far as the anomaly is

monsters are contrary to nature; and nothing exists, strictly speaking, that is not natural.

A more profound examination of this new difficulty would carry us wide of our subject, and would draw us into researches that seem to us useless; in effect, we here touch the great question of the Middle Ages, which is also the great question of contemporary zoological philosophy,—namely, the reality of genera and species. Are there really absolute types constituting for each species what can be called nature, and beyond which all that might be produced could be called contrary to nature? Or, rather, are there only groups of phenomena, more or less stable, whereof none in particular can be called more natural than the others, since all that is is in nature? The only difference would be that some are produced more frequently, and have a greater vitality; the others more rarely, and are more dissoluble, that is, liable to perish; but there would be no absolute separation between the one class and the other.

We do not require to engage in this debate. What we call nature in speaking of living beings, what constitutes for us the normal or natural state, is the *mean* of the phenomena tending to the greatest preservation of the species and of the individual. All that shall deviate but little from this mean, on this side or that, will be considered conformable to nature; all that deviates much will be called contrary, not to nature in general, since nothing can happen contrary to its laws, but to the nature of a certain living species, which, in order to exist, has need of a certain combination of conditions. All that departs from these conditions is, in a certain degree, monstrous, which is the name given when the deviation is very great. Thus, whether genera and species are absolute and fixed types, of which monsters are the contradiction and

compatible with life. When a period arrives in which it ceases to be compatible with life, the monster dies, but only for this reason.' These views are very good, and appear to us quite sound. We will only venture to ask, Why must there, then, be monsters? And what idea could one form of monstrosity but that of an anomaly generally incompatible with life?

the confusion, or whether they are simple means, the constant parts among supple and flexible phenomena, and then that monsters are only particular cases, rarer and less solid combinations, matters little to us;[1] in either case the rule is the agreement of the phenomenon with the preservation of the animal. In both cases monstrosity is an accident, caused by the predominance of the laws of nature in general over the interests of living nature, or of the nature of a certain being in particular. Whatever cause usually produces the agreement of phenomena has not been able in a given case to produce all its effect, and has found itself limited in its action by the action of external causes: the form has not entirely triumphed over matter. This is the sense in which monsters may be called errors of nature.

This point made clear, what we maintain is, that accidental and degenerate forms cannot be considered as the primordial causes of the regular and constant forms. No doubt, given the types, in the more or less wide sense attributed to this word, one can understand that, as a result of the conflict with the general laws of nature, accidental deviations could be produced, but not that by the multiplied reproduction of such accidents, and by the competition established between these freaks of nature, the agreement and uniformity of the phenomena have been established. Order might, indeed, by accident support some disorder, but disorder cannot be the principle of order. Again, in what we now call monsters there is some remainder of the agreement and order which secure the preservation of the normal beings from which they have proceeded; but this principle of order being suppressed, since it, again, is due to heredity, there would only remain the conflict of blind forces.

[1] That the theory of finality is not subordinate to that of the reality of genera and species is manifestly proved by the products of human activity, which are evidently works where finality rules, and which yet only constitute genera and species artificially,—for instance, beds, tables, etc. No one, despite Plato, will maintain that there exist absolute ideas of these kinds of objects, and yet they evidently imply means and ends.

This principle of the conflict of final and efficient causes has been recognised by many great philosophers. Plato was conscious of it when he made two sorts of causes concur in the creation,—on the one hand, the idea of the good, the principle of order, harmony, and wisdom; and, on the other, the *necessary causes*, the conditions of the production of phenomena.[1] Aristotle explained evil in the same manner; Leibnitz also approves the doctrine. He recognises a sort of ideal necessity residing in matter, and which is the cause of disorder and of what we call evil. This opinion, indeed, in the thought of Plato and Aristotle, implied a veritable dualism, and a blind power forming a counterpoise and obstacle to the divine power. But this may be also understood in a good sense, even without admitting matter to be eternal. It is the necessity inherent in the creation itself and in the subordinate causes, which only give themselves to a certain extent to the realization of a design. Even if the absolute unity of the supreme cause be admitted, that cause could only realize its designs by means of laws or properties of nature; and from these natural properties there might always accidentally proceed some injurious effect as a necessary consequence.

Besides, the rencounter and complication of ends, and their necessary subordination, may also accidentally bring about effects apparently injurious, and which are only, as they say, the condition of wellbeing. The Stoics had marked well the origin of such disorders, which are only *consecutive*, and not *essential*. They called them *τὰ κατὰ παρακολουθήσιν*, *per sequelas*. Chrysippus gave an ingenious example of them: 'The general convenience of the body,' said he, 'required that the head should be composed of light and fine bones; but the head has thereby been rendered feebly protected, and exposed to blows.' So the membrane of the eye, to be transparent, must be very light, and thereby easily put out. But nature was satisfied with the adoption of the most general precautions.

[1] *Timæus*, 29, 30, 48.

To those who say that nature, having taken certain precautions, ought to have taken still more, I will answer: How far is this reasoning to be pressed? Ought nature to have taken so many precautions that the organized machine should not be subject to death, and should never perish? But what right have we to require that an organized being should last for ever? And why should it not enter into the plan of a wise being that some should give place to others? This being so, it suffices that there are precautions enough to secure the general continuance of life in the universe, without needing to secure each individual against all possible accidents arising from the rencounter of causes.

We are told: You only see one side of the picture. You see nature beneficent; you refuse to see it doing evil and opposing; in short, you explain the good, but you do not explain the evil. To this we, in our turn, can answer the opponents of final causes: You explain the evil, but you do not explain the good. There would thus, at least, be equality on both sides. But if we wish to consider matters impartially, it will be seen that this equality does not exist.

In effect, he who admits at once final and efficient causes, has more opportunity to explain matters than he who only admits efficient but not final causes. The idea of *end* in no way contradicts the idea of *effect* and *result;* there may very well be at once both ends and results in nature. It is not even necessary that every result be an end, or even a means; it may simply be an inevitable consequence of the employment of certain means with reference to certain ends. Finality and necessity do not exclude each other. The order of things may be at once an intentional and a logical order, without it being possible to say absolutely which of these orders is subordinate to the other; and we are in no way bound to reconcile them to the last detail, which would require absolute knowledge. It is enough for us to conceive *à priori* an explanation of evil that in no way excludes the foresight that has produced good.

Is the situation as favourable for those who are content with affirming efficient, and who deny final causes? Certainly not; for they are obliged to allege that the conflict of efficient causes suffices to produce an apparent co-ordination to an end, but that is what we never see in our experience. Never do we see efficient causes, left to themselves and given up unhindered to grope in the dark, produce some effect similar to a foreseen end; never do we see them co-ordinate their actions in reference to a definite future effect. It is, then, entirely arbitrary to attribute to blind necessity the power of attaining the *best*. Our mind cannot conceive how winds let loose, raging waves, a volcano in eruption—how such a conflict of natural forces should produce a reasonable effect. Yet this is what we must suppose on the hypothesis of a blind mechanism, or, at the very least, attribute to nature a certain instinctive and blind power of intention, which would be itself to recognise in some degree the hypothesis of final causes.

Evil, then, like all the imperfections we have mentioned above, is only the accidental consequence of the conflict of efficient and final causes, and of the conflict of final causes with each other. Those imperfections have given occasion to certain philosophers to suppose that God did not directly put His hand to the work of creating the universe, but that He employed some intermediary, who, being himself an imperfect creature, behoved to commit mistakes, and often to be at fault. Thus Plato, in the *Timæus*, shows us God calling the gods to labour subordinately, and giving them the general plan of His work, which they are thereupon charged to execute. So Cudworth, a Platonic philosopher, imagines a certain *plastic nature*, which instinctively and blindly produces and organizes the universe after the order of God, and which is alone responsible for the disorders and defects of the work. This singular theory, which seems to apply to the divine rule the principles of parliamentary government, inventing responsible ministers to cover an infallible and impeccable sovereign, is

evidently an insufficient palliative; for God would be quite as reprehensible in having chosen insufficient ministers as if He had Himself committed the faults with which they are reproached; and if these faults could have been avoided by putting His own hand to the work, one cannot see why He has not done it. It is hardly generous to cast on inferiors the faults of the great, and to exculpate the sovereign at the expense of the ministers. This is an arrangement which may be wise, in a political point of view, in the government of the state, and is known to every one to be only conventional. But in the government of Providence it is not so; and as it is the sole absolute cause, all action is derived from it, and all responsibility ascends to it.

There is no other issue of the problem of evil than what we are indicating. Whatever world God creates will always be composed of substances and causes having a certain determinate nature, which, consequently, will only be able to enter into a given combination. But that combination, whatever it be, in virtue of the very necessities implied in the nature of things, must needs contain defects and disorders analogous to what we observe in our world. As long as there are beings in time and space distinct from each other, limited by each other, they will necessarily be subordinate to each other. Some will serve as conditions and limits to others; no one will admit of being considered separately as a whole,—it must always reckon with the others, and all with the whole. Hence follow relations without end, which no finite intelligence can possibly follow in all their details; hence apparent or real anomalies, required by the general conditions of the whole; hence the inability of each thing in particular to attain all the ideal perfection of which it is capable. Hence, in short, it follows that the idea of perfection is incompatible with the idea of a finite thing, for a finite thing is only such because it has need of other things to exist. It is thus conditioned by these things, and, in using, depends on them; for these things, having themselves their own nature and their

particular end, cannot be absolutely sacrificed even to superior ends. Thus masters make use of the services of their domestics, but must bear their faults and leave them some personality; for experience teaches us that he who will have too much does not obtain enough. Free produces more than slave labour. So in the universe there will be a greater sum of labour effected if each being knows how to limit itself, and accepts those limits, than if the superior beings had obtained that all the rest should be sacrificed to them; which, besides, has no sense, for as long as there are conditions, these conditions will be a limit, and, consequently, a cause of imperfection.

This is what we may call, with Leibnitz, the *matter* or *necessity* inherent in the essence of the finite thing; and here, with him, we must place the cause of evil. Hence that profound conception, according to which the world would only have been for the creator a problem of *maxima* and *minima*,—to find the greatest sum possible of good, produced with the least possible loss,—a problem analogous to that of the mechanician, who endeavours, in constructing a machine, to obtain the greatest amount of useful work with the least quantity of loss. But there will always be a part of the work employed in moving the machine itself, and consequently perpetual motion is impossible. So in the universe there will always be a part of action or of good which will be lost by the conflict and friction of things upon each other: consequently, absolute good is not possible. What is possible in both cases is a *maximum* or an *optimum;* but to know whether this *optimum* has really been obtained, we would need, on the one hand, to know the divine integral calculus, and the theorems in virtue of which the operation has been made, and, on the other, the data and the condition of the operation itself, both of which are absolutely impossible.

Besides, this were to advance much farther than is necessary here into the domain of the Theodicy. Our problem does not extend so far, and even our method ought to forbid these rash excursions. We have not yet to affirm anything

regarding the primary cause of natural finality, and the existence only of that finality has as yet been the object of our studies. We have had no other aim in this chapter than to explain the contradiction which, in certain cases, experience seems to give to the theory of final causes, without being bound to justify the primary cause of these apparent contradictions. It suffices for our point of view that the exceptions mentioned have nothing inexplicable; as to the justification of Providence, that belongs to another domain.

CHAPTER VII.

THE DOCTRINE OF EVOLUTION.

THE mechanical philosophy, which we have examined in a previous chapter under its abstract and general form, has anew gained favour under a recent theory, and may have thought that it has at last found the means of eluding the overwhelming difficulties that at all times have weighed on it. It is, as Plato says in the *Republic*, 'a new wave' that is rising against us, and which we must yet once more repel, if we wish that the preceding results, so laboriously reared, should remain definitely established.

This new theory is the English doctrine called 'evolution,' a theory whose culminating point is Darwinism. In what does this doctrine consist? This is it in two words: that nothing in nature is produced all at once in a complete or finished form—nothing begins in the adult state; on the contrary, everything commences in the infant or rudimentary state, and passes, by a succession of degrees, through an immensity of phenomena infinitely little, until it at last appears under its precise and determinate form, which, in its turn, is itself dissolved in the same manner by a regression of phenomena analogous to the progress that produced it, which is called the law of *integration* and of *dissolution*. The universe as a whole, as well as in all its parts, is subject to this law; and, in particular, the origin and development of living beings, and the succession of organic species, are explained in the same manner. Borrowed at first from physiology, this theory has by degrees been applied to geology, astronomy, zoology, history, and politics. On every hand men have seen, in

place of sudden appearances, insensible progress, slow and continued developments. By means of this secret and incessant labour of nature, in virtue of which everything always ends by accommodating itself to its medium, men have thought themselves able to explain appropriations and adaptations, which the friends of final causes had always opposed as an insuperable barrier to the encroachments of mechanical philosophy. The examination of this doctrine is, therefore, imperatively required of us here, at least in its relation to the question that engages us; for to study and discuss it in itself would be to leave the sphere of our subject. We will confine ourselves to examining the two following questions:—1st, Does the theory of evolution exclude final causes, and render them *impossible?* 2d, Does this theory supersede final causes, and render them *useless?* If we succeed in proving that the doctrine of evolution neither renders final causes impossible nor useless, we shall have sufficiently proved what concerns us, and shall not have to inquire whether this doctrine is itself true or false.

That the doctrine of evolution does not exclude final causes is quite manifest from the very facts presented by the human mind. In humanity, indeed, the existence of the final cause cannot be denied, and yet it quite harmonizes with the law of evolution. Every sort of project, plan, or combination for the future supposes the final cause, and yet it can only be executed by degrees. A merchant who undertakes a great affair sets before himself an end, which, perhaps, may only be attained several years afterwards; yet to attain this end, he must take a thousand intermediate steps, and, starting from the point where he is, add day by day, and in some sort piece by piece, each of the operations of which the whole must be composed. So with an author composing a book, with a great captain making a plan of battle. It is just the impatience caused by these necessary intermediate steps that explains the pleasure of fairy tales, in which we see the desired thing suddenly produced by the fiat of an enchanter. But this

only happens in fairy tales; in real life, gradation, evolution is the law; and yet this evolution leads to the end.

Human industry, as well as that of nature, only proceeds by degrees, and by a law of evolution. Behold this sheet of paper, it may be said, which appears so suitable for writing, and which seems to have been prepared for that purpose. Well, it is only requisite that some old rags be brought together by some happy circumstance, and encounter a liquid that moistens and washes them, external forces that tear and pound them, so as to make a pulp; it suffices that in course of time, and by happy coincidence, this pulp, rendered quite liquid, be brought into contact with a machine (the origin of which can be afterwards explained in the same way); passing under certain rollers and through a continued succession of degrees of temperature, being gradually heated and dried, it finally becomes a paste, which, in the end, is just what we call paper. Is it not evident that there is here an evolution of phenomena which, from the raw state of the primary matter to the final state of the manufactured article, leaves no void, no rupture? And might not one who did not see the hand of man interposing at each of these operations, or at the origin of them all, believe that he had eliminated all finality, because he could describe, with the utmost exactness, all the elements of the operation, and the insensible transition from each of these degrees to the other? And yet we know well that in this case the whole chain of the phenomena has been prepared and directed to attain the final aim. And if it be objected that the hand of man is obliged several times to interpose, and that, consequently, there is not a perfect evolution, we reply that at least the last operation is developed quite alone, and that, save the initial impulse (which must always be supposed in nature as well as in machines), all takes place by degrees. Whoever, in short, has seen a paper-machine, knows that the liquid paste that passes under the first roller emerges at the end as paper fit for printing, without any other action than that of the machine interposing in

the interval. Besides, our industry being very imperfect, it is very true that we are obliged to perform several different acts of personal intervention before the mechanism spontaneously develops. But the more clever and skilled our industry becomes, the greater is the number of phenomena we can combine with a less number of preparatory acts ; so that, supposing wisdom and power become infinite, it is easy to conceive that a single preparatory act, a single initial intervention, should suffice for endless combinations. In this case, consequently, as in that of human industry, the phenomena are developed regularly, conformably to their laws, without any of them in particular supposing any miraculous action ; and yet the whole will present a skilled combination, from which we shall be able to conclude that the first stroke has been given by an industrious hand.

Not only does the idea of evolution not exclude the idea of final causes, it even seems, on the contrary, naturally to imply it. Evolution is nothing but development, but the word development seems to imply a substance that tends towards an end. The type of this phenomenon is the seed of organized beings —the acorn that becomes an oak. But what impels it to that change but a secret force, tending to realize what is potentially in the acorn—that is, the essence of the oak ? Without such a force, why should not the acorn remain an acorn ? It is, then, in order to become an oak that it is modified. In this manner, in Aristotle's view, the formal cause is identical with the final cause. If we admit at all that a being has a tendency towards the future, aspires to something, we thereby admit some finality.

Besides, history is ready to teach us that the theory of evolution is not at all irreconcilable with the principle of final causes. It would be, in effect, a great error to consider the doctrine of evolution as of recent invention, and exclusively due to English philosophy. The true founder of this doctrine was Leibnitz. He it was who, by the *law of continuity,* by his theory of *insensible perceptions,* by his *principle of the in-*

finitely little, first set up this theory in a learned and profound manner. It was he who said: 'The present is big with the future.' But he never separated his theory of evolution and progress from the theory of final causes. In his view, the principle of the development of monads, and, consequently, of the universe, is what he calls the *appetitus,*—a tendency to pass from one state to another, all internal change of substances being governed by the principle of the end, while the external changes are only produced by external and mechanical causes.

Previous to the last form that the doctrine of evolution has assumed in the English school, it was not usual to oppose it to finality, but to mechanism. The one was the theory of *internal* development, the other the theory of *external* combinations, produced by the approach or separation of the parts. It was hylozoism, in opposition to the geometrical mechanism that excludes all life from nature. Thus the evolutionism of Leibnitz opposed the mechanism of Descartes and Spinoza; or, again, the evolutionism of Schelling and Hegel opposed the atheistic mechanism of the 18th century. But in all these evolutionary doctrines, it was the final cause that ruled and even characterised them.

There is, then, no implicit contradiction, *ipso facto,* between evolution and the final cause. The only question is, how evolution is understood. Is it meant as a simple development of mechanical forces? Why, then, we revert to the old doctrine of fortuitous combinations, an inevitable consequence of mere mechanism. Is evolution meant in the sense of the intrinsic development of the essence? Why, then, we revert to the final cause; for the essence being the law of the development of the being, is thereby its end, since each of the elements of that development is only a step to arrive at the complete realization of the essence, which only serves as the mainspring, while it is at the same time the limit of the action.

But if, meanwhile (without inquiring whether this develop-

ment is external or internal, mechanical or dynamical), we consider in evolution only the *genetic* point of view,—that is to say, that which shows us things in their origin, in their progress and growth, and which causes their gradual production before us,—in place of considering them as all made, which, in a word, according to the expression of Leibnitz, shows us their *possibility*, in this sense the theory of evolution may well be contrary in geology and zoology to what are called *special* or *local creations;* but it has nothing to allege against an intelligent cause of the universe, and, above all (apart from any question as to the first cause), against the existence of finality in nature. For instance, when Mr. Herbert Spencer thinks to oppose the doctrine of final causes and of a creative intelligence by opposing the doctrine of special creations, he mixes up very different questions.[1] Special creations are one manner of conceiving the creative action, evolution is another. The history of philosophy can teach us that the problem in its generality and in all its depth has not been stated by Darwinism. It was so in the 17th century, with the most profound knowledge of the conditions of the problem, both by Descartes and Leibnitz. No doubt, at that period, the mind did not dare to grapple the rugged problem of the origin of man and of life, but at bottom, when Descartes conceived the origin of the world by whirlwinds, it is clear that he did not view it as having been immediately created such as it is; and in that admirable passage of the *Discours de la méthode*, he says: 'I would never wish to infer from all these things that this world has been created in the fashion I stated, for it is much more probable that from the beginning God made it such as it behoved to be. But it is certain, and is an opinion commonly received among theologians, that the action by which at present He preserves it is quite the same as that by which He created it, so that, *even if He had given it, at the beginning, no other form than that of chaos, provided that,*

[1] *Biology*, Part III. chap. ii. Mr. Spencer especially opposes the doctrine of final causes from the objection of evil. See on this point our previous chapter.

having established the laws of nature, He gave it His concurrence to act as it is wont, one may believe, without prejudice to the miracle of creation, that by this alone things purely material would *in time* have been able to become such as we see them at present; and their nature is much more easy to conceive *when they are seen originating by degrees in this way, than when they are considered as entirely made.*'[1]

It is clear that Descartes here states the principle of the doctrine of evolution. Did he, therefore, suppress an intelligent cause of the universe? Certainly not; and although Pascal reproached him with having reduced the action of God to 'a fillip,' this accusation does not apply, because he admitted that creation and preservation are one and the same thing, and that the act by which He creates the universe is also that by which He sustains it. Will it be said that Descartes excluded final causes from physics? We may reply that this is more in appearance than in reality; for when he declares that he has sought the laws of nature without resting on any principle but the 'infinite perfections of God,' was not this to revert in reality to the principle of ends, perfection being the supreme end?

But above all, the philosophical question has been debated between Leibnitz and Clarke, of which question special creations are only a particular case. Yet once more: no one in the 17th century would have dared to apply the question to the origin of living beings, so much did supernaturalism impose its authority in that domain; but without application to such a question in particular, the general discussion was raised none the less. Leibnitz maintained in effect, in all his philosophy, that the highest idea one can

[1] *Discours de la méthode.* 'God has so wondrously established these laws,' says he elsewhere, '*that even if we suppose that He creates nothing more than I have said* (matter and motion), and even if He puts into this no order nor proportion, but makes of it a chaos as confused and perplexed as the poets could describe, *they are sufficient to cause the parts of this chaos to unravel themselves,* and arrange themselves in so good an order that they shall have the form of a very perfect world' (*Le Monde*, chap. vi., ed. Cousin, tom. iv. p. 249).

form of the Creator is to suppose Him creating a world capable of developing itself by its own laws, without causing Him incessantly to interpose in it by miracles. In truth, the dispute of Clarke and Leibnitz bore on a more particular question,—namely, whether the world needs to be wound up and adjusted from time to time. We know that, according to Newton, the actual laws do not guarantee the existence of our world, and that God must interpose from time to time to put it right. The question was, then, of a readjustment of the universe, rather than of special and new creations. However, the principles of Leibnitz can be applied to both cases. When he says, for instance: 'In my opinion, the *same force and vigour always exists, and only passes from matter to matter*, according to the law of nature;' when he says again: 'Why should it be contrary to reason that the word *fiat* having left something behind it,—namely, the thing itself,—the not less admirable word *benediction* has also left behind it in things, to produce their acts, a certain fecundity or acting virtue?'—in these various passages, Leibnitz, like Descartes, immediately appeals to the very principles of the doctrine of evolution, and, in setting aside the *Deus ex machinâ*, he furnishes the principles that can, rightly or wrongly, be employed against special creations; but by these principles Leibnitz did not think, and certainly did not wish, to weaken the part of the divine action in nature. He believed that God had at the beginning imprinted in each creature the law of its development, and that the universe was only the manifestation of that law. In fine, he believed that that law was nothing else than the principle of the *best*—in other words, the principle of final causes. There was, therefore, in his view, no contradiction between evolution and finality.

Thus the question of special and local creations is one thing, with which we are not at all concerned; the question of a cause superior to nature, producing and preserving it by an act essentially wise, is another; and, still more so, the existence of a law of finality in nature itself. That the

doctrine of evolution is gaining ground over the doctrine of special creations we will not deny, but the much more general doctrine of a finality in things is not at all impugned thereby.

For the rest, the learned and acute defender of evolution under its most recent form, Mr. H. Spencer, seems himself to recognise the truth of this, when he tells us: 'The genesis of an atom is no easier to conceive than that of a planet. Indeed, far from rendering the universe less mysterious than before, it makes a much greater mystery of it. Creation by fabrication is much lower than creation by evolution. A man can bring a machine together; he cannot make a machine that develops itself. That our harmonious universe should formerly have existed potentially in the state of diffused matter, without form, and that it should gradually have attained its present organization, is much more wonderful than its formation, according to the artificial method supposed by the vulgar, would be. Those who consider it legitimate to argue from phenomena to *noumena*, have good right to maintain that the nebular hypothesis implies a primary cause as superior to the mechanical God of Paley as that is to the fetish of the savage.' [1]

Let us endeavour to show how the hypothesis of evolution may lead in effect to a conception of finality which only differs from that commonly formed by being grander.

Let the old argument of final causes be applied to the formation of the eye. We ask, How could such a machine have made itself? The answer is, that it did not make itself, but has been gradually produced in virtue of organizing forces which weave and fashion the materials of the organs, muscles, nerves, vessels, and combine them as heart, brain,

[1] *Essays*, vol. i. p. 298. See Ribot, *Psychologie Anglaise*, 2d ed. p. 192. Let us remark, in passing, that the God of Paley is not a mechanical God. As it is impossible to speak without a metaphor, it is certain that when one compares the machines of nature to those of man, we are apt to speak of God as a mechanician. So, at other times, one talks of the divine poet, the great geometrician, the great lawgiver, the sovereign judge, etc. These are modes of expression, and if they are forbidden, we must cease to speak of these things.

stomach, lungs, etc. Be it so; but in place of a single machine to explain, you will have thousands combined together and reduced to one, which is called an organism, a living being. The problem is, therefore, much more complicated than previously, and a much more powerful creative cause is needed. We want to know who has made this complex machine composed of machines. Has it made itself? No, we are told; it existed in virtue of generation—that is, a law inherent in the species, and which makes of the whole species one and the same being, one and the same individual, constantly rising again from its ashes. Be it so. But here again, in place of having to explain one organism, you will have thousands; in place of having a single machine, you will have machines of machines without end, with an ever new force of reproduction. Does it not need, to create those machines of machines, a power and art much greater than to create one by itself? I now ask, Whence comes that general organism, that series of homogeneous machines, called a species? Did it make itself? No, we shall be told; it had its origin in a higher and more general law, the law of transformation. Each species is only a part of an infinite whole, which, multiplying in time and space under a thousand and thousand forms, gives birth to all animal and vegetable species. Be it so again; but then, in place of a single race, you will have thousands of races, all endued with vitality, and with artistic or industrial properties infinitely rich. The *living* (*τὸ Ζῷον*), taken in its most general sense, as one and the same being—this is what you have now before you, in place of the small machine from which we started just now. It is no longer a question of explaining an eye or a tooth, but this vast unbounded organism, peopling air, earth, and water, of beings visible and invisible, all moved and guided in every direction for self-preservation and perpetuation—a world visible and invisible, and whose invisible part is perhaps thousands of times richer and more varied than what is visible. Has this being made itself? No, it will be said; it is itself only the product of the laws of matter, of a

single fundamental law, if you will—that of the conservation of force. Be it so; but then what must be explained is the whole world—that is, an infinite machine, constructing, destroying, reproducing machines without end. Would not the force, whatever it be, that produced this whole by one single act be infinitely superior to that which would only be needed to explain each of the parts? Wherein should the act of creating everything separately by a special volition be superior to the act of creating all at once by a single volition,—always reserving, besides, the part of individual intervention that the creative cause may have reserved for itself, and which does not belong to our subject.

Let us not forget, meanwhile, that in this first part of our work, in this first book, we have set aside the question of the first cause, and have only undertaken to establish as a law the existence of finality in nature, whatever may be the cause of that finality. Manifold and special creations, single creation, spontaneous development of nature, instinct, will, intelligence, genius, secret incomprehensible law, final identity of all things, —all these hypotheses are outside of our present inquiries. Our only question hitherto is this: Is there in the universe a tendency in phenomena to direct themselves towards an end? As to the cause of this tendency we will inquire afterwards. It is, then, evident that the affirmation or negation of special creations has no bearing on our inquiry, since finality may exist equally on either hypothesis, and would still exist even if the idea of creation were set aside, and that of a spontaneous and interior development of nature substituted for it; or even if, in fine, while asserting that the final cause is among the number of second causes, every hypothesis on the essence and mode of action of the first cause were refused.

From all these considerations it follows—1st, That the exclusion of special creations does not contradict the hypothesis of a sole and general creation, dominated by the principle of the best; 2d, That even the exclusion of an external creation would not contradict the hypothesis of an internal evolution

directed by the same principle. Consequently the principle of evolution, taken in itself, is not essentially opposed to the principle of finality.

But if the theory of evolution does not exclude finality, is it not still a means of dispensing with it? If it does not render final causes impossible, does it not render them useless? This is the real difficulty. The more that is allowed to nature, the grander will the divine action, once admitted, appear; for it is more divine to make a great and powerful machine than children's toys. But then, the more that is allowed to nature, the more a divine action (internal or external) seems rendered useless. The more the phenomena are bound together, the more does the part of contingency seem to diminish; the more uncertain and problematic, consequently, does the relation to an end appear. In the case of all being bound together, and, consequently, all explained, the intervention of the end would seem supererogatory, and would only exist in quality of a gratuitous hypothesis of the reason, or of an act of faith, agreeable to our imagination, but not at all necessary to our reason. In a word, the doctrine of finality, which can neither be demonstrated by experiment nor by calculation, must, it seems, be the more imperiously imposed upon our mind the more disproportion there is between causes and effects; and it is this very disproportion that suggests the conception of finality. Science, on the other hand, tends more and more to establish the proportion of causes to effects, and seems thereby to invalidate the finalist hypothesis, and to render it more and more contingent and subjective.

In order precisely to mark the difficulty, let us for a moment suppose the hypothesis of special creations. Here is an unknown island in which we land: the earth is there in labour; the air and the water are in motion; then this labour ceases, and an organized species—a horse, an elephant, or a man—appears suddenly before us. The causes are, by the hypothesis, physical and chemical; the result is a miracle of mechanism. How can we comprehend such a miracle, such a disproportion

between causes and effects, without supposing a rational intervention and a supreme power that has directed these forces of nature conformably to a plan? Suppose, on the other hand, that this animal is nothing but a new form given to a pre-existing animal, in virtue of a law of transformation of which we have examples in nature, since it is in virtue of this law that species furnish races and varieties, the disproportion between the cause and the effect has disappeared; the cause *suffices* to explain the effect. If it suffices, why should I seek another? I will thus ascend from the second animal to a third, from a third to a fourth, and so on; each abyss that we see at present being filled, we shall always find a cause proportioned to the effect, and the opposite hypothesis will always be losing probability, no longer existing except in quality of *free hypothesis*, but not of necessary explanation. Proceeding thus nearer and nearer to the *minimum* of life, we shall only find ourselves stopped by an experimental difficulty. Could this minimum of life ever have originated from inert matter? But if the experiment were once made, vital action would be explained by physical causes as well as chemical action; all causes would correspond to the effects. If, in fine, we ascend to the origin of our world, which appeared to Newton without any proportion to any physical cause whatever, the nebular hypothesis will remove this last difficulty, and will give, in the rotation of a single primitive nebula, a cause sufficient and adequate for the effect produced. No doubt there still remains to be explained the cause of all the universal antecedent, as Mill says; but does not this absolute cause escape our grasp? Is it not purely and simply the unknown? And, besides, we have hitherto left this first cause beyond our inquiries; what we were pursuing was finality in nature. But does not this finality appear to flee before us in proportion as, extending the domain of physical explanations, we render, as it seems, explanations of another kind more and more useless. Such is the formidable doubt that the doctrine of evolution may raise in the mind.

However, looking at it more closely, it will appear that the

preceding difficulty is more formidable in appearance than in reality. In effect, the disproportion of causes and effects, far from being favourable to finality, would, on the contrary, be the negation of it. The words means and end just mean a cause perfectly proportioned to its effect. What constitutes the prodigy of the eye is that it is just exactly what it ought to be in order to be the cause of sight. Wherever, on the other hand, the cause is not proportioned to the effect, there is nothing that could make us suppose a means, nor, consequently, an end. We must well distinguish between the wonder produced in us by a phenomenon without cause—or at least without apparent cause, whence originates the belief of miracles—and the wonder, on the other hand, which the marvellous proportion of causes and effects produces in us, whence arises the belief in final causes. In the first case what subjugates and dominates us is the idea of power, in the second the idea of wisdom. Let us suppose, for instance, that we were present at a resurrection from the dead; not perceiving the means, we will not be impelled to suppose an end (except, at least, we have before obtained that idea in another way). Again, the first idea that men formed of the Deity is that of a destiny which, by a blind volition, creates or overthrows, produces life or death (ἀνάγκη); and it was only later that an Anaxagoras or a Socrates, perceiving the proportion of causes and effects, advanced to Providence. From this it follows that the proof of the final cause exactly follows the progress made in the knowledge of the efficient cause. If it were not known how light is produced, and, on the other hand, how we see, we should only have a vague and obscure notion of the finality of the organ of vision. The same is the case with the lungs and respiration, with the heart and the circulation, digestion and the stomach. We must, then, have already found, physically, a sufficient cause to be warranted ideally and morally to conceive a final cause. If the physical cause were not sufficient, it would not be a good means, or, rather, it would not be a means at all, and consequently it would not imply an end. It

must not be said, then, that the discovery of physical causes renders final causes useless, for without these physical causes the final cause would be doubtful, or even a nullity. An objection against this kind of cause cannot be derived from what is precisely its necessary condition.

No doubt, strictly speaking, it is very true that if we suppose final causes, it is because the efficient or physical causes are not sufficient; otherwise we would rest content with them. But, at the same time, they need to be physically sufficient, else they would not produce their effect, and would not be true means. If I strike iron with a hammer, the hammer, strictly speaking, does not of itself suffice to strike the iron, since it must be directed, but, physically speaking, it must be sufficient to produce the effect, else it would not produce it; so that one who only saw the hammer moving might believe that it was absolutely sufficient, while it is so only relatively, which would be a profound mistake.

The question, then, is this: How do we pass from the purely relative sufficiency of physical agents to the affirmation of their absolute insufficiency? The fundamental reason we have given, and which the theory of evolution does not shake, is the agreement of a whole formed by divergent and heterogeneous causes, with a future phenomenon which can only be produced on condition of this agreement. The farther one removes from a particular group (namely, from this or that organ, organism, organized species, etc.), the farther we ascend from cause to cause, reducing, step by step, the number of the physical agents, it will become the more difficult to explain the multiplicity of agreements and the infinite complication of the results. If I take from a bag five letters which I know form a word, it will even be a great chance if, letting them fall one after the other, I succeed in forming that word; and a much greater still, if, taking them haphazard from an alphabet, I were to make a verse or a poem. What, then, would it be if I made a machine capable of producing without end poems and treatises of science and philosophy? But a brain is such

a machine. If, now, this machine were itself the product of another machine called an organism, and this organism the product of that still vaster organism called a species, and the species the product of that superior organism called the animal kingdom, and so on, it is evident that, in proportion as we simplify causes in a physical point of view, the more we increase, in a moral point of view, the abyss that existed before between a physical cause and a regulated effect.

There is, then, in reality a disproportion between cause and effect. But this disproportion is not physical, but intellectual. The physical cause is a *possibility* of producing the effect, *ab actu ad posse.* It implies only one thing—namely, that there is no contradiction between the properties of matter and the effect produced. But this possibility would not suffice; there must be, besides, an activity or *power* that determines these properties of matter to a precise effect, and circumscribes the endless deviation of its possible effects within a field prescribed by reason. Hence it comes that matter attains to the realization of something intelligible, to which it has no tendency in its own nature.[1]

Thus the hypothesis of evolution does not give in the end one reason more than every other mechanical system, to explain by agents purely physical the order of the universe. It does not explain better how from a primitive chaos a regular system should have emerged. Its ideal would be to reduce all to the laws of motion; but the laws of motion, taken in themselves, as we have seen, would not produce one form rather than another, and do not at all contain the idea

[1] This difference between the *physical conditions* of phenomena, the proper object of science, and their *intellectual conditions*, the object of metaphysics, is allowed by the learned. 'In saying that life is the directive idea or the evolutive force of being,' says Cl. Bernard, 'we simply express the idea of a unity in the succession. . . . Our mind lays hold of this unity as a conception imposed upon it, and it explains it by a force. The mistake would be to believe that that *metaphysical force* is active after the fashion of a physical force. *This conception does not pass beyond the intellectual domain. We must here, then, separate the metaphysical world from the physical phenomenal world, which serves as its basis*' (*Definition de la vie, Revue des Deux Mondes*, 15th May 1875).

of a formation of system.[1] Matter remains matter—namely, the substratum or condition of the development of phenomena; force equally remains what it is, the cause of motion. In neither of these two elements is contained the principle of a rational development. At the least, a third principle would need to be added—namely, the *idea* which will serve for directive cause; and this would be to revert to the doctrine of finality.

From the theory of evolution in general, let us pass to one of its most remarkable applications—that which has most struck the scientific and philosophical world, and which by many is confounded with evolutionism itself—namely, the doctrine of transformism.

We here have not to study transformism in itself—that is the task of zoologists; we have not to take sides, whether *pro* or *contra*, in this debate; and no more have we to choose between the different transformist hypotheses. The question for us always presents itself under the same form—namely, Can transformism, supposing it established and demonstrated, dispense with the principle of finality?

Lamarck is known to have been the founder of transformism.[2] We must, therefore, begin with the examination of his system.

Lamarck employs three principles to explain organic adaptations and the progressive development of animals. These principles are, the *medium*, *habit*, and *need*.

That the physical medium—that is, the combination of external circumstances in which the animal is plunged—exercises a certain influence on the strength and even the

[1] See above, chap. vi. p. 174.

[2] The pages which follow on Lamarck and Darwin were partly published for the first time in 1863, four years after the first edition of Darwin (1859). The ideas, such as they are, that I here put forth cannot, then, have been borrowed from the numerous works afterwards published on the same subject. We desire especially to remark, what had not been well understood in our first publication, although we had said it in express terms, that it is not the transformist doctrine in itself that we discuss (a question for which we declare ourselves incompetent), but the interpretation of that doctrine in the mechanical sense—that is, in the sense of the system of fortuitous combinations.

appearance of its organs, is an incontestable fact. But how far this action and influence may go is not yet precisely known, and we do not intend to take part in this controversy.[1] As yet it does not appear that the actions of the medium, so far as we can know and observe them, penetrate very deeply into the organization. What would seem easiest to explain would be the colour of the skin, and yet it is still matter of dispute among anthropologists. The most important of these external actions are those which we obtain by domestication; but have we ever created a single organ? However great may be the part played by these external agents, and were we to make of the animal a sort of soft paste, as Cuvier said, where would we find a mould capable of producing the complex organs, so skilfully arranged, which the higher animals present? For instance, certain animals breathe by means of lungs, and others by gills, and these two kinds of organs are perfectly appropriate to the two media of the air and the water. Can we conceive that these two media have been able to produce apparatus so complicated and so well adapted? Of all the facts established by science, is there a single one which could justify so great an extension of the action of media? If it be said that by medium we must not merely understand the element in which the animal lives, but every sort of external circumstance, I want to be told what is precisely the circumstance that has made one organ take the form of lungs, another the form of gills? what is the precise cause that has made the heart, that powerful and easy hydraulic machine, the motions of which are so industriously combined to receive the blood that comes from all the organs of the body, and to send it back to them? what, in fine, is the cause that has bound all these organs together, and has made of the living being, according to Cuvier's expression, 'a closed system, all whose parts concur in a common action by a reciprocal reaction?' What will it be if we proceed to

[1] See on this point, Faivre, *La variabilité des espèces*, chap. ii. (*Biblioth philosoph. contempor.*, Paris, 1868).

the organs of sense—to the most wonderful, the eye of man or of the eagle? Darwin himself stops a moment, almost frightened by this problem. The spirit of the system which animates him makes him pass over it; but among scientists who have no system, is there one who would venture to maintain that he in any way perceives how the light could have by its action produced the organ that is appropriate to it, or even, if it is not the light, what external agent is powerful, clever, ingenious enough, a sufficiently good geometrician, to construct that marvellous apparatus which caused Newton to say: 'Could he who made the eye have been ignorant of the laws of optics?'

For the rest, what proves better than any reasoning the insufficiency of the principle of media, is that those naturalists most favourable to that principle have not been satisfied with it, and have employed others concurrently with it. Just here there is an important remark to be made—namely, that the naturalist who is held to have attached the greatest importance to media, Lamarck, understands that action in a very different sense than what might be expected from the received opinion, for he attributes to the medium rather a perturbing than a plastic action.

The fundamental law, according to Lamarck, is the progressive complication of organisms. But it is not the medium that produces this progression. The medium, or modifying cause, on the contrary, does nothing but disturb it; it is it that produces interruptions, hiatus, veritable disorders, and which prevents the animal series from presenting that gradual and continuous scale that Bonnet had defended, according to that celebrated principle: *non datur saltus in natura.* What, then, is the true formative principle of the animals, according to Lamarck? It is a principle distinct from and independent of the medium,—a principle which, left to itself, would produce an uninterrupted series in a perfectly graduated order—namely, what he calls the *power of life.* 'All here rests,' he says, 'on two essential and regulative bases of observed facts

and true zoological principles—namely, 1st, On the *power of life*, the results of which are the increasing complication of the organism, and, consequently, the progress mentioned; 2d, On the *modifying cause*, the products of which are interruptions, various and irregular deviations in the power of life. It follows from these two essential bases—first, that there exists a real progression in the composition of the organization of animals, which the modifying cause has not been able to prevent; then, that there is no sustained and regular progression in the distribution of the races of animals, because the modifying cause has almost everywhere varied what nature would have formed regularly, if that modifying cause had not acted.'[1]

This distinction between the perturbing action of the medium and its plastic action is of the utmost importance for the question that occupies us; for the appropriation of organs to functions being no longer the effect of the medium, but of life, the problem remains entire, and the question still remains how life, a blind and unconscious cause, can adapt all the parts of the animal to their respective uses, and bind them together in a common action. According to this doctrine, the medium can no more be employed as cause, since it is only an obstacle, and without it the organic forms would be much more regular and more harmonious than they are.

The medium being, then, by the confession even of Lamarck, a principle insufficient to explain the production of organic forms, and, consequently, their adaptation, will what he calls the power of life be more fortunate, and by what means will it obtain this effect?

Here Lamarck appeals to two new agents which we have already mentioned, habit and need. He lays down two laws, —first, that need produces organs; second, that habit develops and strengthens them.

[1] Lamarck, *Histoire des animaux sans vertèbres*, t. i. This important distinction between the *modifying* and the *plastic* power does not seem to have been remarked by any naturalist. Yet it entirely changes the meaning of Lamarck's philosophy, since the true agent becomes the internal, not the external agent.

Let the difference of these principles from the preceding be well remarked. In the hypothesis of the medium the modifying cause is entirely external; nothing proceeds from the transformed object. It is like soft wax in relation to the hand that models and kneads it. So is it with those rocks that under the action of water are hollowed out and become grottoes, temples, or palaces. Everything proves that here there is no premeditated adaptation. Is it the same when you employ the power of habit or of need? Certainly not, for these are not external but internal causes; although determined by external circumstances, yet they act from within: they are co-operating causes with the medium. It is they, and not the media, that accommodate the living being to its conditions of existence. Well, supposing that these causes could give account of all organic adaptations (which is more than doubtful), I say that nothing would yet have been gained thereby, for this power of accommodation is itself a marvellous adaptation. Here it is no longer merely, as before, a physical cause, modelling the animal or vegetable from without; it is an internal power co-operating with the external action, and accommodating itself to the needs of the living being. What! there is in the living being a power such that if the medium be modified, the living being is equally modified, to be able to live in that new medium. There is a power of accommodation to external circumstances to take advantage of them, to apply them to its needs. How should we fail to see finality in such a power! Imagine that the living being had the hard and inflexible nature of a stone or metal, such change of medium would become for it a cause of destruction and death, but nature has made it supple and flexible. But in such a flexibility I cannot help recognising a thought, preservative of life in the universe.

It will become more evident if we examine the thing more closely. We must here admit two cases: either the animal is conscious of its need, or it is unconscious; for the lower animals, according to Lamarck, are devoid of perception as

well as the vegetables. In this second case Lamarck maintains that the production of an organ has an entirely mechanical cause; for instance, 'a new motion produced in the fluids of the animal.' But then, if the organ is only the result of a mechanical cause, of a motion of fluids, without any feeling, and therefore without any effort, how is it found to have some adaptation to the needs of the animal? How shall the fluids converge precisely towards the point where the production of an organ would be necessary? And how should they produce an organ appropriate to the medium in which the animal lives? To say that every species of organs is produced,—some useful, others useless, others injurious,—and that the animal only exists when the number of useful organs prevails, is not this simply to revert to the hypothesis of Epicurus, and to attribute all to chance, which we would avoid? Besides, do the facts afford reason for this hypothesis? If the combinations of organs are fortuitous, the number of useless or injurious organs should be infinitely greater than it is (supposing even that there is a single one of this kind, which is not proved); for these two conditions do not absolutely exclude life. And to say that that has been so formerly is to plunge into the unknown, not to mention that palæontological discoveries do not warrant us to think that the fossil animals had been worse made than those of the present.

If, on the other hand, it is a felt need that should itself determine the direction of the fluids, how shall the fluids be directed exactly to where the need exists, and produce precisely the kind of organs necessary for the satisfaction of the need? An animal feels the need of flying to escape dangerous enemies; it makes an effort to move its members in the direction in which it would most easily escape from their pursuit. How shall this effort and need combined succeed in making the anterior members take the form of the wing, that machine so delicate and so wisely combined that all the acutest mechanism of man can hardly guess how it can be

imitated? That the motion of fluids should bring about such difficult combinations, there is needed something else than a vague need and an uncertain effort.

Lamarck owns 'that it is very difficult to prove by observation' that need produces the organ; but he maintains that the truth of this primary law is deduced logically from the second law, attested by experience, according to which the organ is developed by experience and habit. Thus, according to him, because habit develops organs, it follows that need can create them. Is there not an abyss between these two propositions? What! because an organ being given, grows or develops by exercise, it shall therefore be inferred that need can produce an organ that does not exist! Can the production of an organ that does not exist be assimilated to the development of an organ that does exist? We see, indeed, that exercise increases the size, the strength, the facility of action of an organ, but not that it multiplies it and changes its essential conditions. The mountebank has suppler muscles than other men. Has he others?—has he more?—are they arranged differently? However great the power of habit may be supposed, can it, in good faith, go the length of creating?[1]

I know that the theory of the unity of composition may be appealed to, and it may be maintained, with the partisans of Geoffroy Saint Hilaire, that all organs are at bottom only one and the same organ diversely developed; that, consequently, exercise and habit have been able to produce successively, though slowly, those diversities of form which are only differences of development. But is not the doctrine of organic unity, carried so far, a hypothesis itself? Have the great

[1] 'Is there not room to distinguish,' says M. Cournot, 'between the perfections and the abasements of the organism, between the enlargement and the reduction of parts of a type already constituted, and the increase of organic composition, approaching the constitution of a new type?' 'We must not confound,' the same author again rightly remarks, 'the merit of inventing with that which consists of arranging and developing' (Cournot, *Matérialisme, vitalisme, rationalisme*, p. 167).

objections of Cuvier to this hypothesis been all set aside by modern science? Would not the unity of type and composition in the animal series be an ideal and an abstraction, rather than the exact and positive expression of the reality? And besides, would it suffice to show that two different organs are analogous to each other—that is, according to Geoffroy Saint Hilaire, situated in the same place, and bound by the same relations to the neighbouring organs, in order thence to conclude that one of these organs can have taken the form of the other? No; we would need to see that organ itself pass from one form to another, otherwise the analogy does not prove the transition. Thus, for instance, because the trunk of the elephant is the analogue of the human nose, it does not follow that the nose can be changed into a trunk, and the trunk into a nose. Besides, Geoffroy Saint Hilaire has taken care himself to separate his hypothesis from that of Lamarck, and wittily said that we may indeed maintain that a palace and a cottage answer to the same fundamental type, without thereby affirming that the palace had begun by being a cottage, or that the cottage will become a palace.

For some years this law of Lamarck has been studied more closely and experimentally, according to which organs are modified by exercise. M. Marey mentions precise and proving facts which show us how function makes the organ, especially in the muscular and osseous systems.[1] But these facts seem to prove nothing but the plasticity and suppleness of living forms, attributes which themselves imply finality, as we said just now, and which form part of the marvellous conditions of adaptation the organized being enjoys. Whatever be the origin of organized forms, a certain plasticity of forms is necessary; and there is nothing in its existence to contradict the law of finality, since it is itself implicitly contained in that law. The plasticity of organic forms proves that the animal can exert a sort of industry upon itself, can treat itself

[1] R. Marey, *Le transformisme et la physiologie experimentale* (*Cours du Collége de France*, *Revue scientifique*, 2me série, t. iv. p. 818).

as an instrument, as a tool which is prepared for an end. As I can manipulate wood or metal by the hammer or by iron, so I can utilize my muscles with respect to my needs. Do not all these facts go to support the analogy we have so often appealed to between the industry of man and that of nature? and do not they imply on the part of nature precisely what human industry implies—namely, the tendency towards an end? Not only has the animal an end in the efforts it makes to transform its organs, but nature itself has also had an end in enduing the organism with a malleability and a faculty of adaptation necessary to the preservation and development of life.

The facts, moreover, suffice to prove, what is not disputed, that organs are modified by exercise, consequently that function perfects or adapts to itself its proper mechanism. But does it go the length of creating the mechanism itself? How could there be function before the mechanism existed? Let us suppose an animal deprived of all locomotive apparatus. How could it be said that the function of motion exists before being exercised? Here, then, there can be no question of function, but only of the *desire* or *idea* of function. And again, how could there be in an animal the idea of a function before it had exercised it, and without it having had experience of it? The sole question, then, is of a simple *need;* and thus we revert to the first law of Lamarck, a principle which M. Marey himself declares to be 'very vague,' for how can it be admitted that the need of seeing produced eyes, the need of hearing ears? And once more, if it were so, what an extraordinary adaptation of the course of the fluid, and of the labour of the elements, placing themselves so wonderfully in accord with the needs of the animal! Could this be anything else than what we call finality?

In fine, in the examples quoted, the modifications of the organs are directed towards their end by the intelligence and will of the animal; and one can easily understand that if the organic matter is endued with a certain pliability, it will

by degrees adapt itself to the end pursued. Suppose an animal indifferently adapted for leaping, and which yet can only get its food by leaping, it will develop in itself by exercise an aptitude for leaping, and the muscles which serve for that function. It will thus be itself the proper cause of the adaptation of its organs. But in the case of an animal without any species of intelligence, and endued only with a diffused sensation, or of a vegetable in which nothing indicates sensation, what will determine the motion and guide the movements in the favourable direction, instead of letting them go in all directions? The plant needs light, and knows how to take the direction necessary to find it. Who can have given it this habit, supposing it not to be primordial? Whence comes this accord between the passive need of the vegetable for the light, and the precise motion that carries it towards it? By what chance does it find of itself the direction dictated by a mute, insensible, unconscious, unintelligent need? But if we suppose in the plant a vague desire, a dim sensation, a tendency more or less blind or more or less conscious, which might serve as a motive and directing principle, it is not perceived that it is precisely the hypothesis of finality that is generalized: in place of being nowhere it will be everywhere, and will be the very foundation of nature.

I will not dwell longer on the theory of Lamarck, its insufficiency being demonstrated by the very theory which Mr. Darwin has tried to substitute for it. We are entitled to call in question the modifying power of media and habits, when this naturalist tells us 'that he has no great confidence in the action of such agents.' We must now examine what he substitutes for them.

The fact that has furnished a point of departure to the system of Mr. Darwin is so prosaic and vulgar that a metaphysician would never have deigned to cast eyes upon it. Metaphysics must, however, accustom itself to look not only above our heads, but around and beneath us. What! did not Plato admit that there is a divine idea even of the dung-

hill, even of mud! Let us not disdain, then, to enter with Mr. Darwin the stalls of breeders, to seek with him the secrets of the bovine, equine, and porcine industry, and in these productions of human art to discover, if possible, the artifices of nature. The facts of nature are joined together by a bond so fine and continuous, and accidents the most insignificant in appearance are so governed by general and permanent reasons, that nothing can be indifferent to the meditations of the thinker, especially facts which touch so closely the mystery of life.

The breeding of cattle is a veritable industry, and an industry that has precise and strict rules and methods that are followed. The most important of these methods is what is called the *method of selection* or *election*. It is as follows: When he wishes to obtain the amelioration of a breed in a definite direction, the breeder will choose individuals the most remarkable in respect to the quality he is seeking: if it be agility, the most slender; if intelligence, the finest, most ingenious, and clever. The products that will result from this first choice will possess the qualities of their parents in a greater degree, for it is known that individual characters are transmitted and accumulated by heredity. If these products be operated on as was done with the first individuals, the quality sought will go on constantly increasing, and at the end of several generations there will be obtained those fine breeds, all of human creation, which agricultural countries contend for, and which, by skilful crossing, give place to other new breeds, or at least to innumerable varieties.

Well, what man does by his art, why should nature not do for its part? Why not admit a sort of *natural selection*, which may have occurred in the course of time? Why not admit that certain individual characteristics, which were originally the result of certain accidents, have thenceforth been transmitted and accumulated in a hereditary way, and that by this means very different varieties have been produced in the same species, as we produce them ourselves? Let us

admit, meanwhile, with Mr. Darwin, a second principle, without which the first could not produce all that it contains—namely, the principle of *the struggle for life.* It is as follows: All beings in nature contend for food; they all struggle to live, to exist. But there is only for a certain given number of animals a certain amount of subsistence. All, then, cannot alike be preserved. In this struggle the feeble necessarily succumb, and the victory is to the strongest. The strong alone survive, and establish the balance between population and subsistence. We here recognise the celebrated law of Malthus, that has caused so much discussion in political economy, and which Mr. Darwin transfers from man to the whole animal kingdom.

Granting this law, and it is indubitable, let us see how natural selection acts. The individuals of a given species, which shall have acquired by accident a character more or less advantageous for their preservation, and have transmitted it to their descendants, will be better armed for the struggle for life, they will have more chance of being preserved; and when that character shall have been perfected by time, it will constitute for this variety a true superiority in its species. Imagine, now, some change in the surrounding medium, causing this advantage, which had not yet been of much use, to become all at once very necessary, as in a sudden refrigeration, a longer and thicker fur; those that have obtained this advantage will profit by it and survive, while the others will perish. It is evident that the adaptation, on this hypothesis, will result from a coincidence between the accidental production of an advantage perfected by heredity, and an accidental change of medium.

Let us see now how Mr. Darwin, by the help of these principles, succeeds in explaining the origin of species—namely, that in one and the same given type there may accidentally be produced advantages of varied nature, and which do not compete; each profits by its own without injuring that which another has. Hence different varieties,

well armed, although differently, for the struggle for life. Those, on the other hand, that have remained faithful to the original type, and have acquired no new advantage fitted to preserve them in a new medium, perish. Thus the primitive type disappears; only the extreme varieties subsist; and these varieties, becoming in course of time more and more dissimilar, will be called species, because the traces of their common origin will have been lost.

Let us apply this theory to an example but little flattering to the human species, but which is here so indicated that it would be a false scruple not to go that length. One of the most urgent objections made to Darwin is that, if his theory be true, it must be admitted that man began by being an ape, which is very humiliating; to which a partisan of Mr. Darwin has replied, 'that he would rather be a perfected ape than a degenerate Adam.' But on the theory of Mr. Darwin, it is not true that man descends from the ape; for if he did, as he has a great advantage over him, he would have conquered him in the struggle for life, and, consequently, would have absorbed and destroyed him. What is true is, that the ape and man are both derived from one and the same type that is lost, and of which they are the divergent deviations. In a word, on this hypothesis apes are not our ancestors, but they are our cousins-german.

Let us generalize this example. We need not say that the vertebrates have been molluscs, nor the mammalia fish or birds; but the four sub-kingdoms would be four distinct branches, proceeding from one primitive stock. In each sub-kingdom the primitive type would be equally diversified, and it is by these successive determinations, this addition of differences, this accumulation of new characters in always diverging series, that the actual species have been produced. In a word, the organized kingdom has always gone from the general to the particular, and, as would be said in logic, by continually increasing the content of its comprehension.

Such I believe to be, in its essential bases, and without

changing anything, the system of Mr. Darwin,—a system which he defends with mental resources truly inexhaustible, and, above all, with admirable candour; for, unlike inventors of systems who only set forth the facts favourable to their ideas, and are silent as to those that are contrary, Mr. Darwin devotes the half of his book to stating the difficulties and objections that may be raised by his principle, some of which are so formidable that he has great difficulty in diminishing their weight. Has he, however, come to the capital difficulty that weighs upon the whole system, and which, for our part, holds the mind in suspense? We do not believe it, and this is what we will try to prove.

The real rock of Mr. Darwin's theory, the dangerous and slippery point, is the passage from artificial selection to natural: to establish that a blind nature, without design, can have attained, by the coincidence of circumstances, the same result that man obtains by a reflecting and calculating industry. In artificial selection, in effect, let us not forget, man chooses the elements of his combinations; to attain a desired end, he chooses two factors, both endued with the character he wishes to obtain or perfect. If there was some difference between the two factors, the product would be uncertain or mixed; or even when the character of one of the factors predominated in it, it would still be enfeebled by its mixture with a contrary character.

In order that natural selection might obtain the same results,—that is, the accumulation and perfecting of some characteristic,—nature would have to be capable of choice; in a word, the male, endued with such a characteristic, must unite with a female just like himself. In this case, I admit that the multiple of those two factors would have the chance of inheriting that common characteristic, and even of adding to it. It would still require this multiple or product to seek in its species another individual which should also have accidentally attained the same character. In this manner, by a succession of similar selections, nature could do what

human industry does, for it would act exactly in the same way.

But who does not see that I employ an impossible hypothesis? For how can we admit that an animal that has undergone an accidental modification (a shade more or less in colour, for instance) will just seek to discover in its species another individual affected at the same time by the same modification? That modification, being accidental and individual in origin, should be rare, and, consequently, there are very few chances for two such individuals to meet and to unite. The blind desire which conducts the male towards the female cannot have such a clairvoyance, and if it had, how striking a testimony for finality would it be! And supposing, what is so unlikely, that such a rencounter once took place, how can we admit it to be renewed in the second generation, then in the third, the fourth, and so on? It is only on this condition of a constant rencounter between two similar factors that the variety will be produced and fixed. Otherwise, deviating with each new couple, the modifications will have no constant character, and the type of the species will alone remain identical. We boast of the short time needed by human industry to produce a new variety; and it is said: What cannot nature do, that has ages at its disposal! It seems to me that in this case time does not matter. The whole knot lies in the multiplication of the advantage sought for, a multiplication requiring thought to choose.

There are found in the human species itself examples of varieties produced by selection, but that results from constant and successive unions between similar subjects. Thus the Israelitish type is easily recognisable, and still persists since ancient times, notwithstanding the changes of the medium; but the Israelites marry among themselves, and preserve in this way the distinctive traits that characterise them. Suppose mixed marriages,—suppose that, prejudices disappearing, the Israelites were to marry with the rest of the population,—how long would the Israelitish type last? It would very

soon be absorbed and transformed. There is, near Potsdam, M. de Quatrefages tells us,[1] a village specially remarkable for the size of the inhabitants. Whence arises this specialty? It arises, we are told, from this, that the father of Frederick the Great, who liked handsome men, chose the tallest peasant women he could find as wives to his grenadiers. This is quite artificial selection, let us not forget. Thus Plato, in his *Republic*, while prescribing marriage by lot, yet advised the magistrates to cheat a little, and to couple, without seeming to do so, the handsomest women and men, in order to obtain vigorous citizens. It is evident from all these examples, that selection always supposes the rencounter of a common character in the two sexes. This cannot take place in nature, that entirely accidental character being first of all very rare, and those that might possess it at the same time having no reason to meet and choose each other.

I know that Darwin distinguishes two kinds of artificial selection—one that he calls methodical, the other unconscious. Methodical selection is that of the breeder, who combines his elements as, in mechanics, the wheels of a machine are combined. Unconscious selection is that by which the amelioration or modification of a species is obtained without that precise result having been sought,—like that of a hunter, for instance, who makes no pretence to perfect the canine race, but who, by taste, is led to choose the best dogs he can procure, and obtains, by the force of things, an accumulation of qualities in that breed. Thus, probably, the various canine varieties have been formed. There is no scientific method here, and yet the result is the same, although slower. It is the same in nature, according to Mr. Darwin. It practises an unconscious selection, and the agent that here takes the place of choice is the struggle for life. Those most favoured necessarily prevail by right of the strongest, and nature is found to have chosen spontaneously, and without knowing

[1] *Unité de l'espèce humaine.*

it, the subjects best furnished to resist the attacks of the medium,—in a word, the most appropriate.

We here reach the core of the system. That we may duly appreciate it, let us distinguish two different cases; either the surrounding medium does or does not change. What will happen on these two hypotheses? We must here notice a great difference between the doctrine of Lamarck and that of Darwin. According to the former, while the medium does not change, the species must remain unmoved, once it is by habit adapted to that medium; having in effect what it needs in order to live, we do not see why it should try to change. But if the cause of change is natural selection, it should be able to occur even in a fixed medium; for however well adapted a species may be, one can always conceive that it might be more so: there may always occur some accidents that would secure to certain individuals an advantage over others, and would in some sort afford them a greater opportunity. And thus one does not see why, on this hypothesis, species should not vary before our eyes. It would not even need for this, so far as appears, vast periods of time, when we think with what rapidity human industry creates new varieties.

Why, then, do not we see such modifications produced? Because the principle of natural selection, even united to the principle of the struggle for life, cannot, as it seems, have the virtue attributed to it by Mr. Darwin. Let us suppose, in effect, that in hot countries their colour is an advantage, rendering the inhabitants better fit to bear the heat of the climate. Let us suppose that in one of these countries there are only whites, and that, at a given moment, an individual is found accidentally coloured black; he will have an advantage over his compatriots,—he will, if you please, live longer. But he marries. Whom can he wed? A white woman, beyond dispute, the black colour here being accidental. Will the child resulting from this union be black? No, doubtless, but a mulatto; the child of the latter will be of a still lighter

shade, and in some generations the accidental tint of the first will have disappeared, and been swallowed up in the general characters of the species. Thus, even admitting that the black colour would have been an advantage, it would never have time enough to perpetuate itself so as to form a new variety more appropriate to the climate, and which would thereby prevail over the whites in the struggle for life.

If doubts be entertained of the value of the argument that I here propose against the range of Mr. Darwin's principle, I would invoke the authority of another naturalist, M. de Quatrefages, although very favourable to that principle. He mentions several individuals of the human species that have been found accidentally endued with exceptional characters, and he wants to explain why these individuals have not given birth to new varieties. 'A Lambert,' says this naturalist, 'or a Colburn (the names of these abnormal individuals) *has formed no alliance with another individual* presenting the same anomaly as himself. Selection here tended to efface the superabundant and teratological activity of the skin, the excessive number of the fingers. *With each generation the influence of the primitive normal fact would forcibly diminish* by the mixture of the normal blood: it must soon end by disappearing altogether.' Afterwards he explains, by the absence of artificial selection, the relative uniformity of the human groups compared with the domestic animals. Does it not follow from this, that natural selection is insufficient to vary species, for this main reason, on which I have so much insisted—namely, that the different individuals of the two sexes accidentally affected by the same character could not meet?

An analogous objection to the principle of natural selection has been put in the form of a mathematical argument by a learned Englishman.[1] He takes, for example, a certain category of butterflies, called *Leptalis*, whose colour is protective,

[1] *The Theory of Natural Selection in a Mathematical Point of View*, by Mr. Alfred W. Bennett, 1871. (See the *Revue scientifique*, 2d series, t. i. p. 100.)

because it makes them like other butterflies, called *Ithomia*, which the birds avoid for their tainted smell. The species of *Leptalis* which is found to have an accidental resemblance in colour to the *Ithomia* thus gets the benefit of their immunity. Mr. Wallace attributes this advantage gained by the privileged *Leptalis* to natural selection. Mr. Bennett opposes him with very close reasoning.

'It is evident,' says the latter author, 'that to pass from their ordinary to their protective form, the *Leptalis* must have undergone a series of gradual transformations; and we can hardly estimate at less than a thousand the number of forms that must have succeeded between the first deviation and the form at last observed. On the other hand, it is clear that the first degenerate *Leptalis* cannot have sufficiently differed from their sisters to deceive the appetite of the birds interested in recognising them under their disguise, and it is a moderate supposition that, during the first fifth part of the period of supposed transformation, the birds were not deceived. If so, the butterflies not being yet preserved by their new dress, every reason of selection disappears, and we must regard as entirely left to chance the continuation of the metamorphosis. The chances which this has of being realized can then be very approximately calculated. Let us take, in effect, a couple of *Leptalis*, and suppose that the species had a tendency to vary in twenty different directions, of which only one tends to approach the *Ithomia*. In the first generation, the chances a favourable variation has of being produced are represented by the fraction $\frac{1}{20}$; and even this valuation is very favourable to the hypothesis of Mr. Wallace, for among the numerous offspring of a pair of butterflies, there would certainly be found more than twenty forms very little different, and deviating from a determinate form.

'In the second generation, the forms that already had a tendency to remove from the form *Ithomia* will have no reason to return to it; and it is solely in the twentieth part of the offspring of the first couple that we can reasonably hope

to find forms more or less approximating to the protective form. But, in this twentieth, selection does not yet act; chance will still preside over the production of the form sought for: a twentieth only will assume that form. But this will only represent the twentieth of the twentieth; thus the chances will be represented by the fraction $\frac{1}{20}^2$. At the end of ten generations the chances will be reduced to $\frac{1}{20}^{10}$—that is to say, that in ten billions of individuals one only will have preserved the marks of the primitive deviation. This is an absolutely negative result, and compels us to reject the hypothesis of selection, since, before even the latter could have had any reason to produce it, the accidental primitive variation would have completely disappeared.'

This reasoning does not mean to deny the principle of natural selection, but to limit its action. It suffices us to prove here that it does not suffice, of *itself*, to explain the origin of organized forms. There must be, besides, an internal principle of transformation; thereupon the idea of finality resumes its whole empire. This is granted by an American naturalist, Professor Cope, who has developed the hypothesis of Darwin, explaining organic evolution by a growth-force, determined to propagate itself in this or that direction by the desire or imagination of the animal. '*Intelligence is the origin of the best*,' says he, 'while natural selection is the tribunal to which are submitted the results obtained by the growth-force.'[1] This hypothesis, besides being a return to that of Lamarck, grants to the theory of finality in reality much more than it asks, since it is to the intelligence of the animal that the principle of organization and fabrication would be definitely reduced, which, at bottom, would be Stahl's hypothesis. Without pronouncing on this hypothesis, let us merely gather this additional testimony to the impotence of external and accidental causes for the production of organic forms.

Yet once more, we do not in any way dispute the principle of *natural selection*, nor that of *the struggle for life*. They are

[1] *Revue des cours scientifiques.*

two very true laws, established by experience, but which apparently must act in a direction entirely different from what we are told, and much more in the direction of preserving the species than in that of modifying it. In effect, the kind of life of an animal depending always on its structure (whether final causes be admitted or not), it is evident that, in a species, the most favoured are those whose organization is most conformed to the type of the species. In the carnivora, for instance, that one will have the advantage which shall have good claws, strong teeth, and supple and vigorous muscles. But if you suppose a modification intervening, which could ultimately be an advantage in other conditions, it will, nevertheless, at its origin be an inconvenience, by altering the type of the species, and thereby rendering the individual less fit for the kind of life to which its general organization calls it. Suppose that in a herbivorous animal the molar teeth, so fit for chewing soft grass, were accidentally replaced in some individuals by incisors. Although the incisor is really an advantage for those species that possess it, since it permits them to conjoin two kinds of food, it would, nevertheless, be a very great disadvantage for the animal in which it should accidentally occur, for it would thereby be less able to find its habitual food, and there would be nothing in it prepared to accommodate itself to another species of nourishment.[1] I conclude that natural selection must, in a medium always the same, result in maintaining the type of the species, and in preventing it from changing; I cannot see in it, except accidentally, a principle of modification and change.

[1] M. Cournot thinks with us, 'that a mechanical choice does not suffice to explain the marvel of organic adaptations. . . . Of what use to the elephant for "the struggle for life" would be a nose longer than that of its comrades, though much shorter than was needful to obtain its food?' (Cournot, *Matérialisme, vitalisme, rationalisme*, p. 166.) The same author concludes, likewise, that 'by substituting for a sudden transformation a slow gradation, the mechanical explanation is rendered less offensive, and its grossness is in some sort concealed, although, at bottom, there still is sought, from a mechanical cause, what it is incapable of giving.' (*Ibid.* p. 166.)

Is it so when the medium itself is changed, when, from whatever causes, the external conditions come to be different? It is then, according to Darwin, that the principle of natural selection acts in an all-powerful manner. If, in effect, at the moment of this change of medium, some individuals of a species are found to have certain characteristics, which just render them fit to accommodate themselves to that medium, is it not evident that they will have a great advantage over the others, and that they alone will survive, while the others will perish? By the operation of natural selection, an at first individual character may thus become specific.

Here, evidently, Mr. Darwin's hypothesis appears to most advantage, but it is still subject to very great difficulties. And, first, it must be admitted that the modification in question has occurred at the same time and in the same place among several individuals of different sex. In effect, as we have shown, if it is not at the same time in both sexes, this quality, far from accumulating and becoming determinate by heredity, would be constantly growing weaker, and no new species could be formed. Here, then, already is a first rencounter or coincidence that must be admitted. In the second place, it must be supposed that each animal species has originated in the coincidence of an accidental modification with a change of medium, which multiplies without end the number of coincidences and accidents. On this hypothesis, while a certain series of causes altered organic forms according to particular laws, another series, according to other laws, altered the media. The adaptation in the animals would only be the point of coincidence between these two series. But as the appropriate forms in the organism are counted by thousands, or, rather, cannot be numbered, we must admit that these two series of parallel causes have harmoniously coincided a thousand times, or, rather, an infinite number of times,—that is, we must abandon to fortune, not to say to chance, the chief part in the development and progress of the animal scale. Is this a truly rational explanation?

One of the gravest difficulties still remains. Cuvier has greatly dwelt, in his zoological philosophy, on the law of organic correlations; and although there may be a difference as to the extent of this law, it remains generally true. According to it, the organs are bound together by logical relations, and the form of each is determined by that of the others; whence it follows that certain coincidences of organs are impossible, while others are necessary. Consequently, if a chief organ undergo an important modification, all the other essential organs must be modified in the same way to preserve equilibrium. Otherwise an entirely local change, however advantageous it might be in itself, would become hurtful from its disagreement with the rest of the organization. If, for instance, as Lamarck believed, the scales of fish could have been transformed into birds' wings (which Cuvier declared absurd in an anatomical point of view), the sound of these same fish must, at the same time, be transformed into lungs, which appears to Mr. Darwin the most striking example of his theory. Now, without discussing the reality of the facts, I say that these two correlative and parallel transformations cannot be explained by a simple accident. Mr. Darwin seems to have wished to anticipate this objection, by admitting what he calls a *correlation of growth*. He owns that there are connected and sympathetic variations, that there are organs that vary at the same time and in the same manner,—the right and left sides of the body, the limbs, and the jaw; but this law leaves the difficulty unsolved. Either this is an entirely mechanical law, that only indicates simple geometrical relations between the organs, and has no reference to the preservation of the animal,—and then it does not serve to solve the problem,—or else these correlations of growth are precisely those required by the change of medium, or of external conditions, and then how can they be understood without a certain finality? By what singular law should organs that can only act in harmony be modified at the same time and in the same way, except there were here some foresight of nature? Here, again, the

simple coincidence does not suffice, for it is the coincidence itself that must be explained.

It is evident that the theory of fortuitous modifications, without a directive principle, presents the greatest difficulties when applied to the formation of the organs;[1] but these difficulties are much greater still as regards the formation of the instincts.

It is well known what Lamarck's theory was on this point. Instinct, according to him, is a hereditary habit. Mr. Darwin adopts this theory, while modifying it by the principle of natural selection. He remarks that the same thing can be said of the instincts as of the organs. Every modification in the habits of a species may be advantageous, quite as well as a modification of organs. But when a modification of instinct is produced in a species, it will tend to perpetuate itself, and, if advantageous, will secure to those endued with it the preponderance over the other varieties of the species, so as to destroy all the intermediate varieties. True, it cannot be proved by direct observation that instincts have been modified, but some indirect observations seem to warrant this supposition—such, for instance, as the gradations of instinct. Thus, the making of honey by bees presents three distinct types, but connected together by insensible gradations. First, the humble bees, which make their honey and wax in hollow trees; next, our domestic bees, which have solved in the construction of their cells a problem of the higher mathematics; and lastly, the American bees, an intermediate species inferior to our bees, but superior to the humble bees. Can we not see here the trace and indication of a development of instinct, which, starting from the lowest degree, has gradually reached the point at which we see it now? What warrants this conjunction is that, by thwarting the industry of bees, by placing them in new or unfavourable conditions, it has been found possible to vary their habits and change their procedure. Many experiments made in this direction might throw great light on this obscure question.

[1] See chap. ii.

The theory that explains instinct by hereditary habit is, beyond doubt, specious, and very worthy of attention; nevertheless, it still presents very serious difficulties. First, the variations of instincts, which may be observed in certain particular circumstances, would not necessarily disprove the existence of a primitive instinct proper to each species; for, even on this hypothesis, nature, having attached an instinct to the animal for its preservation, may have determined that that instinct should not fail just when the least change might take place in the external circumstances. A certain degree of flexibility of instinct is by no means irreconcilable with the doctrine of irreducible instinct. For instance, nature, having given to the bird the instinct to construct its nest with certain materials, was not bound to determine that if these materials were to fail the bird should make no nest. As our habits, however mechanical they may be, are yet automatically modified, if ever so small an external circumstance happen to oppose them, it might be the same with the instincts or natural habits imprinted from the beginning in the very organization of each species by the provident Author of all things.

Another grave objection may be raised against the application of the principle of natural selection to the formation of instincts. According to Mr. Darwin, the modification of instinct, which was at first accidental, was afterwards transmitted and fixed by heredity. But what is an accidental modification of instinct? It is a fortuitous action. But can a fortuitous action be transmitted hereditarily? Notice the difference that there is between a modification of organ and of instinct. The first, however slight and superficial it may be, —were it the colour of plumage,—is permanent, and lasts for life; it is durably impressed on the organization, and one can conceive it transmitted by heredity. But an instinct is nothing else than a series of given acts; a modification of instinct is, therefore, a particular action which becomes fortuitously intercalated in this series. How can we believe that this action,

though it were by chance several times repeated during life, could be reproduced in the series of actions of the descendants? We see fathers transmit to their sons fully formed habits (although imitation and similarity of media must be taken into account); but we do not see the son reproduce the accidental actions of the father. What facts would not have to be quoted to render credible so strange a hereditary transmission!

If it were doubted that Mr. Darwin assigns a great enough part to chance in the origin of the instincts, I would recall the example he himself mentions — namely, the instinct of the cuckoo. It is known that the female of this bird lays its eggs in another nest than its own. This instinct, which belongs to the cuckoo of Europe, is not found in that of America. Mr. Darwin conjectures that the European cuckoo may formerly have had the same habits as the American. 'Suppose,' says he, 'that it had happened, though seldom, to lay its eggs in the nest of another bird. If the mother or her young derived from this circumstance some advantage—if the young bird, profiting by the mistaken instinct of an adoptive mother, became more vigorous, it may be conceived that an accidental fact became a habit advantageous to the species, for all analogy invites us to believe that the young birds thus hatched will have inherited more or less the deviation of instinct which led their mother to forsake them. They will become more and more inclined to deposit their eggs in the nests of other birds.' Here is, indeed, an accidental and fortuitous action considered as hereditarily transmissible. I will ask zoologists whether they allow that the power of heredity could go so far?

A great number of facts would have to be collected and discussed to appreciate at its true worth the theory of hereditary habits. I shall only mention one, which appears to me absolutely opposed to every theory of this kind — namely, the instinct of the *necrophores*. These animals have the habit, when they have laid their eggs, of seeking the bodies

of animals to lay them beside their eggs, that their young, as soon as hatched, may at once find their food; some of them even lay their eggs in the dead bodies themselves. But what is here incomprehensible is, that the mothers that have this instinct will never see their young, and have not themselves seen their mothers. They cannot, therefore, know that these eggs will become animals like themselves, nor, consequently, foresee their needs. In other insects, the *pompilia*, the instinct is still more remarkable. In this species the mothers have a kind of life entirely different from their young, for they are themselves herbivorous, and their larvæ carnivorous. They cannot, then, conclude from their own case what will suit their offspring. Shall we here have recourse to hereditary habit? But this instinct must have been perfect from the beginning, and is not susceptible of degrees; a species that had not had this instinct precisely as it is would not have existed, since the young, being carnivorous, absolutely need animal food ready for them when they come into the world. If it be said that the larvæ were originally herbivorous, and that by chance, and without an end, the mother, attracted perhaps by a special taste, went and laid its eggs in dead bodies; that the young, born in this medium, became by degrees accustomed to it, and from herbivorous became carnivorous; that then the mother herself gave up the habit of laying in dead bodies, but that by a remnant of association of ideas she continued to seek those bodies, now become useless for herself, and to place them near her eggs, and all that without aim, we multiply so fearfully the number of fortunate accidents which could produce such a result, that it would seem much better to say we know nothing about it.

It is very important, from our point of view, to establish that transformism is susceptible of many forms, and that, since Darwin, very different systems have been proposed, without giving up the common general idea. But the more one studies these systems, the clearer is the proof of the difficulty

of explaining organic forms by purely mechanical and external causes. I will mention, for instance, *polymorphism*. On the hypothesis of Darwin, species are produced by passing from the general to the particular, from simpler and more abstract to richer and more concrete forms, nearly as in the philosophy of Hegel. A very small number of types would thus suffice to begin with, and perhaps only one to engender, in course of time, all the living species. M. Agassiz has brought a very serious objection against this system—namely, that if it were so, in proportion as we descend into the geological strata and reach a higher antiquity, we should meet simpler forms and in smaller number. But it is found to be quite the contrary, and that the farther we proceed the more do we find different and complicated forms. This objection, strong against Darwinism, does not affect transformism in itself. Other naturalists, in effect, admit that the first appearance of life, however it may be explained, may have just as well been manifested in thousands of different forms as by a single type. Some go so far as to think that originally there were only individuals, and that the species itself is the product of time. However that may be, transformism in no way excludes a plurality of types at the first. The present species might be produced from previous but different species.

It is evident that polymorphism is a hypothesis intermediate between Darwinism and the common doctrine. According to Darwinism, all organic forms are definitely produced by external causes, and derived from the principle of natural selection. According to polymorphism, the existing species have been, indeed, produced by the same causes, but the primitive species owed their origin immediately to the creative forces of nature. There was thus a moment in which nature was capable of producing in great number organic types, although it no longer does so now. But these organic forms, however different they were from those of the present, yet behoved to be adapted forms, since they were living. Thus adaptation was not the effect of time or of natural selection:

it was produced at the very first, and the abyss that separates dead matter from living must have been cleared at a bound. The impossibility of fortuitous coincidences producing so many diverse organizations—an impossibility which Darwinism artfully seeks to conceal—reappears in all its force.

The doctrine of evolution rests upon a principle true in itself, and which Leibnitz has illustrated, the principle of continuity—namely, that nothing is produced that does not originate in a previous state, nothing that is not connected with the past, and having its consequences in the future. The principle is incontestable, but like every abstract principle, we must know how it should be understood. Is the transition from one state to another necessarily and always slow and insensible? Does it only take place by imperceptible degrees? Does not every one know, for instance, that in his own life, while usually facts originate from each other by an insensible gradation, one grows old without perceiving it, ideas and sentiments change unconsciously? On the other hand, in many circumstances, changes are rapid, sudden, prodigious: one grows old in a day; a sudden death breaks the charm of the sweetest life; a terrible passion originates in the twinkle of an eye; in human society there are insensible changes and violent revolutions; in history we cannot suppress crises, unexpected falls, prodigious good fortune. There are thus two sorts of continuity,—one rapid, the other slow; two sorts of change,—the one abrupt and sudden, the other slow and imperious. Hence this question arises: How are the transformations produced that create new species? Hence also two hypotheses in transformism,—that of slow and that of abrupt modification.

A learned botanist, M. Naudin, one of those whom Darwin himself owns as one of his precursors, has defended the doctrine of abrupt transformism against the Darwinist hypothesis of infinitely small modifications, accumulated by time and fixed by heredity. He urges two reasons. The first is, that infinite time is not available, as the Darwinists

persuade themselves. 'According to the most recent calculations,' says M. Naudin, 'the *maximum* duration of animal life upon our globe can be approximately estimated at about fifty millions of years at the very most, and the farther progress of science will never raise this estimate, but, on the contrary, will tend to restrict it.' Now fifty millions of years may seem a very good figure; but in reality it is absolutely insufficient to explain the production of all the organic forms if we suppose them produced by insensible modifications. Not millions of years, but thousands of millions of ages would be required.[1]

In the second place, the theory of insensible modifications is entirely contrary to experience. What experience gives us is, in fact, abrupt, not slow change. The study of botany proves this; and M. Naudin, who has so thoroughly studied the variations of botanical species, is here a weighty authority. 'When even a very notable change is produced,' says he, 'it occurs abruptly in the interval from one generation to another. The fixation of varieties may have required time, but their appearance has always been sudden.' According to this new form of transformism, the variation would take place in the germ itself, or during the period of incubation, and the external circumstances so often appealed to, the climate, medium, and habits, would only have very little importance. 'When the species vary,' says M. Naudin, 'they do so *in virtue of an intrinsic and innate property, which is only a remains of the primordial plasticity*; and the external conditions only act by determining the rupture of equilibrium that permits this plasticity to produce its effects.' The *natural selection* of Darwin, on this hypothesis, plays only a very secondary part.

[1] If we consider that in certain parts of the American continent, formed by the accumulated shells of polyps, we can, according to Agassiz, go back 200,000 years, we perceive we can thus reach the 250th part of the total duration of animal life in the globe; but if, at this depth of antiquity, not even the shadow of a variation has been detected, how can we believe that 250 times more time could have sufficed to traverse the interval separating the primitive cell from humanity!

The species fall of themselves when they have exhausted the quantity of plastic force that they contained, as they originate in virtue of that same force. 'As I view the matter,' says the author, 'the feeble perish because they have reached the limit of their strength, and they would perish even without the competition of the stronger.' In a word, M. Naudin's point of view (and it is done to please metaphysicians) is to substitute, in the theory of evolution, for external, accidental, and purely fortuitous causes, an internal plastic force, which, from a primordial protoplasm, 'derives the great families of organization, then the secondary, and, descending from the general to the particular, all the forms actually existing, which are our species, breeds, and varieties.'

This doctrine, if true (and the reasons given by M. Naudin seem to us of great force), leaves intact the whole prodigy of final causes, and evidently destroys all that was believed to be gained by Darwinism. The latter, in effect, tried to explain the organism as the result of a thousand internal or external causes, which must necessarily produce thousands of forms of some kind, among which the struggle for life undertook to make a choice. Thus the part of chance was concealed, and the incalculable number of fortunate circumstances that had to be supposed was lost in the immensity of time. But if the passage from one form to another is abrupt and sudden, the problem is still the same, and evolution furnishes no new outlet to escape the difficulty. How does matter spontaneously and blindly find such marvellous adaptations? How does it realize so many different ideas? How does it pursue such complicated plans and combinations? Is not the transition from one form to another a true creation?

We have already seen in Darwinism, that the principle of natural selection had seemed to us insufficient without the intervention of the principle of finality. Imagine only the number of fortunate circumstances that must be accumulated to produce, I do not say the human organism, but merely a fly's foot; and among the innumerable mass of fortuitous

accidents to which it would be subject, how could the organized machine resist and survive if it had not in itself a plastic and esthetic force, which makes the useful form predominate over those that are injurious and embarrassing? But if slow evolutionism itself has need of finality, abrupt evolutionism still more imperiously requires it; for, excluding groping and long experience, it can only explain the appearance of forms by an internal *plasticity*, which is only, under another form, 'the *principle of finality*, a mysterious power,' says M. Naudin, 'indeterminate, a fatality for some, for others a providential will, whose incessant action on living beings determines at all periods of the world's existence the form, volume, and duration of each of them, by reason of its destiny in the order of things of which it forms a part. It is this power that harmonizes each member with the whole, by adapting it to the function it must fulfil in the general organism, which function is its reason of being.'[1]

Having studied the doctrine of evolution in its general principles and most important applications, it will be useful still to examine it more closely and in detail, in the system of its most eminent and profound interpreter, Mr. Herbert Spencer, confining ourselves, be it understood, to the point of view of our subject.

In the first instance, nothing can be more finalistic than Mr. H. Spencer's ideas on the nature of life and organization; for he reduces the idea of life to two principal characters: 1st, Internal co-ordination; 2d, External correspondence with the medium. But what would seem more teleological than these two characters?

'Life,' he first says, 'is a co-ordination of actions; whence it follows that an arrest of co-ordination is death, and that imperfect co-ordination is disease. Moreover, this definition harmonizes with our ordinary ideas of life in its different

[1] *Revue horticole*, 1852, p. 102. The preceding analysis of M. Naudin's theory is derived from his *Notes on Related Species and the Theory of Evolution* (*Revue scientifique*, 6th March 1875).

gradations, seeing that the organisms which we rank as low in their degree of life are those which display but little co-ordination of actions, and that the recognised increase in degree of life corresponds with an increase in the extent and complexity of co-ordination.'[1]

But this character does not suffice; a second must be added--namely, correspondence with the medium, or 'the continued adjustment of internal to external relations. This is what is seen especially in the embryo, in which, from beginning to end, there is a gradual and continued adjustment, all the phases of the organism in process of formation strictly corresponding to the phases of the medium.' It might, indeed, be said that in chemical phenomena there is also a correspondence between the internal changes and the external relations; 'but this correlation does not, in the abstract, differ from the connection between the motion of a straw and the motion of the wind that disturbs it. In either case a change produces a change, and there it ends. The alteration undergone by the object does not tend to induce in it a secondary alteration that anticipates a secondary alteration in the environment. But in every living body there are alterations of this nature, and it is in this production that the correspondence consists. The difference may be best expressed by symbols. Let A be a change in the environment, and B some resulting change in an inorganic mass. Then A having produced B, the action ceases. Though the change A in the environment is followed by some consequent change, a, in it, no parallel sequence in the inorganic mass simultaneously generates in it some change, b, that has reference to the change a. But if we take a living organism, and let the change A impress on it some change C, then, while in the environment A is occasioning a, in the living body C will be occasioning c, of which a and c will show a certain concord in time, place, or intensity.'[2]

[1] *Principles of Biology*, Part i. chap. iv.

[2] *Ibid.* chap. v. Still these formulæ do not sufficiently explain the difference of the two cases, for it might be said that in chemical combinations, as well as in

This explanation of life would be the best formula that we could have chosen to explain the very essence of finality; for it indicates that there is not only a simple relation between A and C, but a proportion which can be expressed thus:—$A : C :: a : c$, or conversely, $c : a :: C : A$. That is to say, that if such a relation exists between two states A and C, the first, being modified, must produce in the second an analogous and proportional modification. But that such a correspondence and proportion should take place by the mere play of the elements is, as it has seemed to us, impossible.

Let us translate into sensible facts the preceding abstractions. In order that combustion may occur, there must be a certain relation between the combustible and the medium. Let the medium change, let this correspondence cease (for example, let there no longer be oxygen enough in the medium), and combustion ceases. This is what happens when a lamp goes out. But in living beings it is not so. When the medium changes, it produces a change in the organism, often even a change by anticipation, as if in foresight of the change of the medium, and this renders possible the continuation of action. Thus the embryos of viviparous animals are fed in the mother's womb by a direct communication with the mother; but this communication ceases at a given moment—a separation takes place between the two beings. What a prodigious revolution! Must it not cause death? Not at all: in the new medium there is a new food all ready in the

the organism, a change in the medium is also followed by a change in the object. For instance, if oxygen is necessary to combustion, when oxygen disappears or is less abundant combustion ceases or is weakened. There would thus be likewise here four corresponding terms:—1st, In the medium A, production of oxygen; 2d, In the object B, combustion; 3d, In the medium a, diminution of oxygen; 4th, In the object b, diminution of combustion. So, if for oxygen another agent be substituted, another combination will succeed the preceding combination. Thus the change of medium will then likewise have its correspondence in the object. To prove the difference between the two cases, the inorganic and the living, it must be added that in the former case the change will be *any* change, while in the latter the change is *predetermined*—that is, commanded in the interest of the preservation of the whole—as if, for instance, when oxygen disappears in the medium, the object found means to produce it spontaneously, in order that combustion might still go on.

mother's breasts. It is evident that so considerable a change in the medium would be mortal if it were not accompanied at the same time by a similar change in the embryo, in anticipation and foresight thereof—that is to say, a prehensile organ, the lips, endued with a force of suction perfectly adapted to the future act on which the preservation of the young depends. I repeat it: this correspondence of four terms, instanced with so much wisdom by Mr. Herbert Spencer as the characteristic trait of the organism, is precisely the fact we have employed to prove the existence of finality. How should such proportions and accommodations be the result of mere mechanism? How could the blind play of the elements at this point simulate art and invention?

So, then, co-ordination and correspondence are the two constituent characters of life. How are these results explained? By laws which, like the results themselves, seem to have every appearance of finality. In effect, correspondence is explained by the law of *adaptation*, and co-ordination by the law of *integration*. Or rather, adaptation and integration are only two different names given to correspondence and co-ordination; the act is taken in place of the result. Adaptation is the act by which life acquires and preserves the correspondence necessary to its duration, and integration is the act by which life co-ordinates its differential elements. To say that an organ is endued with adaptation, is to say that it is apt to produce in itself secondary changes corresponding to the changes of the medium; and to say that an organ is endued with a power of integration, is to say again that it is apt to produce a greater or less co-ordination, in proportion as external or internal causes produce in it a greater or less number of differential modifications. But what are these two aptitudes but the essential and characteristic attributes of that fundamental force that we have called finality?

For all this, we would be greatly deceiving ourselves, despite the appearance of the formulæ, did we think to find in Mr. Spencer anything like finality. In these very facts that

he describes so justly, he sees, and means to see, only the development of mechanical forces, the corollaries of the fundamental law, the conservation of force. If he reproaches Lamarck, and even Darwin, it is for not having completely purged science of all finality, internal or external, and even of all plastic direction (*vis formativa*), the last refuge of occult qualities.

'In whatever way it is formulated, or by whatever language it is obscured, this ascription of organic evolution to some aptitude naturally possessed by organisms, or miraculously imposed on them, is unphilosophical. It is one of those explanations which explains nothing—a shaping of ignorance into the semblance of knowledge. The cause assigned is not a true cause—not a cause assimilable to known causes; not a cause that can be anywhere shown to produce analogous effects. It is a cause unrepresentable in thought; one of those illegitimate, symbolic conceptions which cannot by any mental process be elaborated into a real conception. In brief, this assumption of a persistent formative power, inherent in organisms, and making them unfold into higher forms, is an assumption no more tenable than the assumption of special creations, of which, indeed, it is but a modification, differing only by the fusion of separate unknown processes into a continuous unknown process.'[1]

We have not to defend against Mr. H. Spencer the hypothesis of an unconscious evolutionism, for we have ourselves opposed it in this work (Book ii. chaps. ii. and iii.); but evolutionism in itself in no way excludes, as we have said, an intelligent cause at the origin of things, and such a cause is as conceivable by the mind as mere mechanism. The whole question is, Which of these causes is the more adequate to the effect? Hitherto it has seemed to us that mechanism was an inadequate cause; let us see whether the system of Mr. H. Spencer can fill the gaps we have mentioned. We must ascend to what he calls first principles.

[1] *Biology*, Part iii. chap. viii.

In his book of *First Principles,* of which we can only give here a very succinct *resumé,* Mr. H. Spencer establishes two propositions, as representing in the most general form the tendencies of all the changes in the universe: 1st, Nature tends to proceed from the homogeneous to the heterogeneous; 2d, It likewise tends to proceed from the indefinite to the definite. It is needless to add that there is likewise a double law of return in the reverse direction—namely, the tendency beyond a certain limit to return from the heterogeneous to the homogeneous, and from the definite to the indefinite. But this second aspect of things (or dissolution), which, with the first (integration), composes the whole fact of evolution, does not particularly interest us here, and we can place it out of view.

Let us briefly explain the two laws.

1st, 'The progress from the simple to the complex across a series of successive differentiations is shown in the first changes of the universe to which the reasoning leads us, and in all the first changes that can be inductively proved. It is shown in the geological and meteorological evolution of the earth, and in that of each of the organisms that people its surface. It is shown in the evolution of humanity, whether considered in the civilised individual or in the groups of the race. It is shown in the evolution of society in the threefold point of view of its political, religious, and economic institutions. From the most remote past to the novelties of yesterday, the essential feature is the transformation of the homogeneous into the heterogeneous.'[1]

Now what are the laws in virtue of which this passage from the homogeneous to the heterogeneous is made? There are two fundamental laws. The first is the law of *the instability of the homogeneous;* the second, the law of the *multiplication of effects.* What do these two laws consist of?

a. 'Homogeneity is a condition of unstable equilibrium.' In effect, 'in a homogeneous aggregation the different parts are exposed to different forces in species or in intensity, and

[1] *First Principles,* Part ii. chap. xvi.

consequently they are differently modified. Because there is an internal and external side, because these sides are not equally near adjoining sources of action, it follows that they receive influences unequal in quality and quantity, or both together. It follows also that different changes must be effected in the parts that are differently influenced.'[1] Such is the law called the *law of the instability of the homogeneous.*

This law presents great enough difficulties, not merely as to being admitted, but even for being understood; for how can there be in a primitive whole absolutely homogeneous forces different *in species*, and even in intensity? How can there be in the whole an internal and an external side? What is the external side of the universe?—and how can there be something apart from it? No doubt, if the matter is merely to explain the origin of a secondary whole,—for instance, our planetary world,—we may start from the hypothesis of a nebula that will have an internal and external side, and that can be attracted by different forces. But to warrant such a hypothesis, the technical considerations of Laplace will always have more weight than the abstract speculations of philosophers. What is meant when one speaks of first principles is, not the origin of a particular whole, but of the whole in general, of a primordial state, supposed to be absolutely homogeneous, in the totality of things: wherefore the distribution of force must be as homogeneous as the distribution of matter; whence also there are no longer forces different in species and intensity—there is no internal or external side in the whole. In such a supposed homogeneity at the beginning, whence would change arise? If there is an equilibrium during a single instant, what shall disturb it? The primitive homogeneity, once supposed in equilibrium, will remain so indefinitely—at least till an external motor imparts a change to it, and we then revert to the hypothesis of the first motor; or, at least, till we suppose an internal principle of development impelling the homogeneous to diversity. But

[1] *First Principles*, Part ii. chap. xx.

this principle no longer has anything mechanical, and is not deduced from the laws of matter and force. But if, in fine, the author objects to this hypothesis of an absolutely primitive state as inaccessible to our speculations, and if he has only meant to speak of secondary wholes, such as the solar nebula, the protoplasm of living beings, the seminal germ, etc., it must be acknowledged that the initial point is then no longer the homogeneous but the heterogeneous, since to explain the instability of the homogeneous he is always obliged to have recourse to 'the dissimilarity of the position of the parts in relation to the ambient forces.' But diversity of situation is just a sort of heterogeneity. If, in fine, we are told that the question is not to lay hold of a determinate state, but only of a tendency, and that everywhere we see things go from the homogeneous to the heterogeneous, and then return in the opposite direction, we answer that, even in virtue of this tendency, we are warranted to ascend hypothetically, and at the very least ideally, to the most homogeneous homogeneity possible, which, being supposed to be so, will therefore be immutable. We must conclude that this hypothesis of an absolute homogeneity implies a contradiction—that, however high we ascend, we must still admit the existence of the *same* and the *other*, as Plato said (τὸ αὐτὸ and τὸ ἕτερον), and that, consequently, the heterogeneous is quite as much a principle as the homogeneous itself.

b. The second law that explains the transition from the homogeneous to the heterogeneous is the *law of the multiplication of effects.* The author formulates and develops it as follows. He affirms that 'a uniform force, falling on a uniform aggregate, must suffer a dispersion; and that, falling on an aggregate composed of dissimilar parts, it must suffer a dispersion from each of these parts, as well as qualitative differentiations; that the more dissimilar these parts, the qualitative differentiations must be the more marked; that the greater the number of parts, the greater will be that of the differentiations; that the secondary forces resulting from it

must undergo new modifications, by effecting equivalent transformations in the parts modifying them; and that it must be the same with the forces they engender. Thus, these two conclusions—namely, that (1) a part of the cause of the evolution is found in the multiplication of the effects; and (2) that that multiplication increases in geometrical progression in proportion as heterogeneity augments—these two conclusions, I say, are derived from the fundamental principle, the conservation of force.'[1]

Without insisting on this deduction, which would oblige us to enter too deeply into the analysis of a system that we have only to examine from our own point of view, we will say that the law of multiplication of effects is so evident in experience that it would be useless to insist upon it.

2d, But still these two laws (instability of the homogeneous, multiplication of effects) only explain one thing—namely, how things come from the uniform to the multiform, from unity to plurality. They do not explain the second property of evolution—namely, how it goes from the indefinite to the definite. 'We have not yet found the reason,' he says, 'why there is not produced a vague and chaotic heterogeneity in place of the harmonious heterogeneity produced in evolution. We have still to discover the cause of the integration accompanying differentiation.'[2] Integration is the distribution of elements in coherent and definite systems. Now one can understand that the thing should advance from the same to the other,—that is, in differentiating itself,—but that these differences themselves form determinate and regular wholes does not seem to result from the law.

The solution of this new problem is in the *law of segregation.*

This law consists in this, that 'if any aggregate, composed of dissimilar units, is subjected to the action of a force exerted indifferently on all these units, they separate from

[1] *First Principles*, chap. xx. [2] *Ibid.* chap. xxi.

each other and form smaller aggregates, each composed of units similar among themselves for each aggregate, and dissimilar from those of the others.'[1] For instance, if a single gust of wind has just struck a tree in autumn, covered both with yellow and green leaves, the dead leaves fall to the ground, and form a separate group from that of the green leaves that remain attached to the tree. So in the mineral subjected to the action of fire, the iron falls to the bottom by its own weight, and may thus be separated from useless elements. The electric attraction separates small bodies from great, light from heavy. Chemical affinity, acting diversely on the various elements of a given body, permits us to remove this or that element while leaving the others. There thus takes place a sort of choice in nature (κρίσις), in virtue of which the *homœomeries* (to use an expression of Anaxagoras) tend to separate from the chaotic state, or rather incessantly prevent it from forming. But the *Νοῦς* of Anaxagoras does not interfere in the operation.

Such are the general principles of evolution. These fundamental laws have to be applied to the formation of organized beings. We will suppose, then, in virtue of these laws, that the organized world began as a homogeneous mass, a *protoplasma* apt to take any kind of form. This protoplasm, in virtue of the two laws just mentioned (namely, the instability of the homogeneous and the multiplication of effects), incessantly passes from the homogeneous to the heterogeneous—whence the formation of varieties, races, and species. All animal life ramifies by a progressive differentiation, just as the individual, starting from the indistinct state of the germ, determines more and more at each new degree of its development. Embryology is the image of zoological history.

This passage from the homogeneous to the heterogeneous takes place under subjection to an infinite number of internal or external causes,[2] which, acting variously on the unstable homogeneity, tend to modify it in all directions, and thus to

[1] *First Principles*, chap. xxi. [2] *Biology*, Part iii. chaps. viii. and ix.

produce an infinite diversity. The mutability of species is thus only an application of the fundamental laws of nature.

But it is not enough to explain the diversity of forms. We must still explain their suitableness, their precise and determinate character, their adaptability to the ambient medium, their internal concordance, etc. Animal life, like nature itself, does not merely proceed from the homogeneous to the heterogeneous; it goes from the indefinite to the definite: it tends to form systems more and more coherent, more and more *integrate*, according to the author's language.

This effect is due to the law of segregation, which is called in zoology the law of natural selection. Selection, in effect, plays in the biological order the same part as segregation in the mechanical.[1] It is it that effects the choice that in some sort sets apart forms suitable and in harmony with the medium, and drops the others. In a word, segregation in the organic order is called the *survival of the fittest*.

We ought to add one consideration more—namely, that according to the *first principles*, the general law of evolution—that is, of the progressive distribution of matter and motion—tends to a relatively stable state, which is *equilibrium*,[2]—not to an absolute equilibrium, which would be repose, but to an *equilibrium movens* (for example, that of our planetary system). But the organic world, as well as the inorganic, equally tends to equilibrium. Only here the equilibrium is double, for the system of the organized being must first be in equilibrium with itself, and, in the second place, in equilibrium with the medium. Here we find, again, our two conditions of life—namely, correspondence and co-ordination. Now this double equilibrium is obtained in two ways, either directly or indirectly.[3] Direct equilibrium occurs by adaptation; indirect equilibrium by selection. The former case occurs when the medium directly produces upon the organism the advantageous change that is required; the latter occurs when

[1] *First Principles*, chap. xxi. [2] *Ibid.* chap. xxii.
[3] *Biology*, Part iii. chaps. xi. and xii.

inability to live causes the less fit to disappear, and allows only those to subsist that are in harmony with the medium.

We have thus summed up as succinctly and clearly as possible the vast system of Mr. Herbert Spencer. Our aim is not to refute it, which would require a wider discussion than we can engage in. We shall only inquire whether, allowing the whole system to stand, it is possible to preserve it without introducing into it an intellectual element, external or internal, conscious or unconscious, rational or instinctive,—whether we can appeal exclusively to the double principle of force and matter to obtain the formation of a system and an order in things,—whether there must not be something else, which may be called with Hegel *idea*, with Schopenhauer *will*, with Schelling the *absolute*, with Leibnitz the *divine wisdom*, but which is distinguishable from the insensibility of matter. The knot of the question always is, whether the law of segregation—that is to say, of mechanical choice—is capable of producing a work of art; for whatever be the cause of the bird, the dog, or of man, beyond doubt these creations present themselves to our eyes with all the characters of a work of art.

The disproportion between the cause and the effect seems evident to us, for segregation, as has been seen, has no other effect than to separate into dissimilar wholes similar parts,—that is, to reform with heterogeneous wholes homogeneous groups; while, on the other hand, organization consists in making heterogeneous elements co-operate in a common action. The very idea of organization thus appears irreducible to the law of segregation.

It is said that natural selection is itself a segregation; that it separates the strong from the weak; that it lets drop the impotent to preserve the fittest; that it thus assembles all those that have a common character, a determinate aptitude, to set them apart (*segregare*). But this conciliation between *selection* and *segregation* appears to us arbitrary and quite external. In the mechanical order it is segregation that forms

groups, while in the biological order selection does nothing but preserve groups already formed. In fact, before selection can take place, the fittest must already be in existence. There must previously have been a formation of systems. Selection does nothing but assure the preponderance to the fittest, but it does not itself produce that adaptation. The adaptation is presupposed; but adaptation here constitutes the coherent and definite form that has to be explained, and, therefore, selection has not produced that form. On the other hand, in the purely mechanical order, it is segregation that, in a heterogeneous whole, separates the similar elements, to form of them new wholes. There is thus only an analogy of names between *selection* and *segregation*, and a profound difference of nature.

How should segregation, a purely mechanical agent, be in a position to solve the problem of correspondence and proportionality that is set in the living being, and that Mr. H. Spencer has himself so well analyzed? That problem, in effect, amounts to this: Such a state of the medium A being fit to produce in the organized being such a change *a*, how is it that, to a new state of the medium C, there precisely corresponds in the organism the change *c*, which is necessary for the organism to exist? We have here a rule of three solved by nature. How should such a success be rendered possible by the mere fact of the segregation of similar parts?

Let the problem be well understood. As regards the first relation, that existing between A and *a*, nothing is required, for we can understand that any medium, acting on any mass, must produce a certain effect, which is quite undetermined beforehand; and this is the actual effect. But this first relation once established, all those that follow are determined by the first. Any change, any effect, is no longer sufficient, but a bespoken and predetermined effect; for it must be, on the one hand, in agreement with the organism, and, on the other, with the medium. But this double determination, this double correspondence, cannot be explained by any segregation

or selection, since it must pre-exist in order that the selection may have room to take place.

Let us explain this by some examples. Let a mass fit to live be plunged into a medium at once nutritious and respirable. Let this medium nourish this living mass. There will here, I allow, be no more difficulty than in the action of fire on a mineral mass. But let circumstances so change the medium, that, while remaining respirable, it is no longer nutritive, and let the nutritive element be only placed at some distance from the living being, what is the modification required of the organism to become fit for this new state of things? It is evident that henceforth it needs motor organs. But how should it suffice for the production of these organs that the need of them should make itself felt? And if it were so, would not such a fact prove a pre-established harmony, amply sufficient to demonstrate the law of finality? It must, then, be admitted that such organs pre-exist,—that is to say, that some causes have produced them,—and that, the change of medium supervening, the advantage remained with those that were endued with them. But from this it is evident that selection has created nothing, and that it is not the veritable cause, for the organs already must have existed in order that selection might adapt them to the medium. Let us continue the hypothesis. Instead of abundant food equally disseminated in all parts of the medium, or, at any rate, at some distance, let us, on the other hand, suppose this food thin sown, dispersed at wide intervals; what a chance whether even an animal endued with motion should fall in with it! Something more, then, is necessary,—there is needed a sense that can traverse space and direct the steps,—there must be sight. But here, again, the same reasoning applies as before. How are we to believe that the simple need produces the organ? And if it produced it, what a proof of finality! The organ, then, must have pre-existed, to be found ready at the moment when the change of the medium rendered it necessary, or to facilitate to the animal itself the change of

medium; and yet once more, it is not selection that has produced the organ,—that is to say, that has given a coherent and definite form to the passage from the homogeneous to the heterogeneous,—for the organ, even before assuming the superiority to the fittest, is already by itself a coherent and definite form. The production of organs by the action of the medium (except when it would not fall under any of the above-mentioned laws) is no more admissible, for only the most superficial adaptations can thus be explained. It remains to be said that some causes have produced some modifications in the primitive homogeneous mass, and that, when these modifications have been found agreeing with the interest of the living being, these forms have subsisted; which amounts to saying, in simple and clear terms, that organic forms are the product of chance. Divergent and heterogeneous causes producing all sorts of actions in the medium and in the living being, each fortunate coincidence constitutes a new organ or a new species. This point of view differs little from that of the ancient Atomists, as Aristotle summed it up: ὅπως ἔτυχε.

Having examined the agreement of the living being with its medium, or *correspondence*, let us now consider the internal agreement of the living being with itself, or *co-ordination*.

Here the difficulty is still greater than before. How, in fact, can we comprehend co-ordination being produced in the very proportion to the differentiation of the parts? We admit, in effect, that the primitive homogeneity incessantly tends to differentiate, and that its various parts also progressively reach forms and functions more and more special; but it does not follow from any of the previous laws that this differentiation, caused by purely mechanical agents, is ruled by the principle of the common interest, or that this division of labour is established in a hierarchic and systematic manner, and not blindly and like a chaos. Will it be said that—if the division of labour did not take this systematic form, if the diversity did not end in compatible organs and functions—the

being would not live, and that, consequently, the only ones that could live, and that experience gives us to know, are those in which this compatibility has been met with? Be it so; but it is the explanation of Epicurus, and Mr. Spencer, with all his formulas, adds nothing to it. Besides, we will still ask how and why such a compatibility can have occurred, since it might well have been that there were no living beings at all. To find unity in diversity is to do a work of invention. How has nature been so inventive as endlessly to produce types compatible, whether with themselves or with the corresponding medium? Of this we here find no explanation.

No writer has more forcibly shown than Mr. H. Spencer the close correlation that *ought* to exist in the animal between *differentiation* and *integration*,—that is to say, between the division of labour and the concentration or co-ordination of the parts. He expresses himself on this subject as follows:—

'If a *hydra* is cut in two, the nutritive liquids diffused through its substance cannot escape rapidly, since there are no open channels for them, and hence the condition of the parts at a distance from the cut is but little affected. But where, as in the more differentiated animals, the nutritive liquid is contained in vessels that have continuous communications, cutting the body in two, or cutting off any considerable portion of it, is followed by escape of the liquid from these vessels to a large extent, and this affects the nutrition and efficiency of organs remote from the place of injury. Then where, as in further-developed creatures, there exists an apparatus for propelling the blood through these ramifying channels, injury of a single one will cause a loss of blood that quickly prostrates the entire organism. Hence the rise of a completely differentiated vascular system is the rise of a system which integrates all members of the body, by making each dependent on the integrity of the vascular system, and, therefore, on the integrity of each member through which it ramifies. In another mode, too, the establishment of a distributing apparatus produces a physiological union that is

great in proportion as this distributing apparatus is efficient. As fast as it assumes a function unlike the rest, each part of an animal modifies the blood in a way more or less unlike the rest, both by the materials it abstracts and by the products it adds; and hence, the more differentiated the vascular system becomes, the more does it integrate all parts, by making each of them feel the qualitative modification of the blood which every other has produced. This is simply and conspicuously exemplified by the lungs. In the absence of a vascular system, or in the absence of one that is well marked off from the imbedding tissues, the nutritive plasma, or the crude blood, gets what small aeration it can only by coming near the creature's outer surface, or those inner surfaces that are bathed by water; and it is probably more by osmotic exchange than in any other way that the oxygenated plasma slowly permeates the tissues. But where there have been formed definite channels branching throughout the body,—and, particularly, where there exist specialized organs for pumping the blood through these channels,—it manifestly becomes possible for the aeration to be carried on in one part peculiarly modified to further it, while all other parts have the aerated blood brought to them. And how greatly the differentiation of the vascular system thus becomes a means of integrating the various organs, is shown by the fatal result that follows when the current of aerated blood is interrupted.'[1]

In this passage Mr. H. Spencer clearly proves that, in fact, the differentiation of parts is accompanied by a greater integration; he shows, besides, that it *ought* to be so. But why is it so? This is what he does not tell us. The necessity of which he speaks is only ideal and intellectual, not physical. It must be so, if there must be living beings; but that such beings are necessary is in no way evident. The connection between integration and differentiation is a connection of finality, not of consequence and mechanism.

[1] *Biology*, Part v. chap. ix. pp. 368–370.

One can easily be convinced of it by comparing mechanical with organic integration. In the former case, integration takes place when, in a whole already differentiated, the similar parts separate to form new groups; but organic integration, on the other hand, is the reunion of heterogeneous or dissimilar elements in a common group—that is to say, in an organism. The problem to be solved is to explain the formation of a unity in a multitude of divergent parts. This the law of segregation in no way explains. Even if it were said that it is by segregation that the dissimilar parts separate, and that the similar parts are drawn together, so as to form distinct organs, there would still remain the same difficulty—namely, how these distinct organs co-operate together. Add to this, that the organ itself is not always composed of similar parts, and that it is often itself the unity and harmony of a multitude of very distinct component parts—for instance, the eye. In fine, the grouping of similar parts into different wholes would still not explain the structure and form assumed by these wholes, and the reciprocal accommodation of these structures and forms.

The term equilibrium only serves to mask the difficulty, without resolving it; for the equilibrium here in question is purely ideal, and has nothing to do with mechanical equilibrium, or the balancing of forces. No balancing of forces can explain how it is that, where there is produced an organ to separate the urea from the blood, and another to separate the bile from it, there should be produced at the same time canals to make the blood communicate with both. This kind of agreement cannot be represented nor measured by any mathematical formula. There is here a relation of another order.

There remains, then, to explain internal co-ordination, like external correspondence, the law of natural selection. But this law is only negative, and not positive; it suppresses the impotent, but produces nothing itself. Adaptation and co-ordination must already exist for it to preserve those that are endued with them. Thus we always come back to the

same point, that any agents having produced any modifications on living matter, only such of these modifications can subsist as *are found* in agreement with themselves and with the medium. Yet once more, it is the fact of a happy coincidence, and that is what every one calls chance. All Mr. H. Spencer's scientific apparatus, the whole mass of these examples accumulated to satiety, all that mechanical and dynamical terminology, can neither mask nor relieve this low and common result, the only one that can be disentangled from these diffuse amplifications—namely, that organic forms are the product of fortuitous combinations of matter. And no other hypothesis is possible: hence any internal or external directive principle is rejected. The fortuitous is the veritable artist, the seminal agent of nature. It is the *deus absconditus*: its name is not mentioned, but it is hidden behind the scenes. Lamarck, at least, and even Darwin, sometimes allowed the possibility of a plastic principle which might give form to matter. But we have seen that Mr. Spencer expressly and systematically excludes this hypothesis. Now as organic co-ordinations do not exist potentially in the laws of force and motion, they can only result from a lucky cast of the elements. Such is the last word of this system, which, notwithstanding all its promises, furnishes us no new means of filling the abyss that separates a blind cause from an ordered effect.

To sum up. The theory of evolution, applied to organized forms, may have two meanings. Either it expresses nothing else than the gradation of organic beings, rising by degrees or intervals from less to more perfect forms,—and in this sense the theory, which is that of Leibnitz and Ch. Bonnet, contains nothing opposed to the doctrine of final causes, and even, on the contrary, naturally appeals to it,—or else the theory of evolution is only the theory of chance under a more learned name—it expresses the successive gropings attempted by nature, until favourable circumstances brought about such a throw of the dice as is called an organization made to live;

and thus understood, the doctrine of evolution falls under the objections which such an hypothesis has at all times raised. Transformism, then, under whatever form it is presented, shakes none of the reasons we have given above in favour of natural finality; for, on the one hand, it is not irreconcilable with it, and, on the other, it is inexplicable without it.

This last proof finished, we can regard our first task as accomplished, which was to establish the existence of a law of finality in nature. What now is the first cause of that law? This second question, much more arduous than even the first, will be the object of the second part.

BOOK SECOND.

THE FIRST CAUSE OF FINALITY.

BOOK II.

THE FIRST CAUSE OF FINALITY.

IF the series of inductions which we have developed in the previous book be admitted, we shall be brought to this conclusion, that there are ends in nature. But between this proposition, and this other that is generally deduced from it,—namely, that a divine understanding has co-ordinated all towards these ends,—between these two propositions, I say, there is still a long enough interval.

What have we, in fact, seen? That human intelligence acts for ends; that, by analogy, it must be admitted that the animals act for ends, not only in their so-called intelligent, but also in their instinctive actions; that, in fine, by extension of the same reasoning, living nature must be considered as also acting for ends. Thus our argument would signify that living nature expresses, in its rudimentary form, the same property that is manifested under its most salient form in human intelligence—namely, the property of acting for ends, or finality. Finality, then, is one of the properties of nature; such is the result of the preceding analysis. But how should this analysis enable us to emerge from nature? how enable us to pass from facts to the cause? The force of our argument lies precisely in this, that we do not change the genus, but that in one and the same genus—namely, nature—we pursue the same fact or the same property under different forms. But if, on the other hand, in place of following the same order, whether ascending or descending, we suddenly pass from nature to its cause, and say there is in nature such a being (itself a member and part of the whole) which acts in a certain manner, therefore the first cause of this whole

must have acted in the same manner,—if, I say, we reason thus,—and this is what is generally called the evidence of God from final causes,—it cannot be doubted that we very boldly and rashly draw a conclusion which is certainly not contained in the premises.

The legitimate and natural impatience of believing souls, who would have philosophy to guarantee to them an evidence from reason equal to the evidence of feeling, by which they are convinced, can hardly bear the application to such problems of the methods of trial, approximation, and cross-questioning, which are the peculiar features of the scientific method. It is hard to see the noblest beliefs of humanity weighed in the balance of a subtle dialectic. Of what use is philosophy, we are asked, but to obscure what is clear, and to shake what it defends? It has been thought by some a sufficient praise of such spiritualist philosophy to say: It does not hinder us from believing in God. In this order of ideas, in effect, it seems that demonstration weakens rather than proves, affords more doubt than light, and teaches us to dispute rather than to decide.

We are as sensible as any of this anxiety and trouble; and the fact mentioned, which is nothing but the truth, is one of the proofs of the feebleness of the human mind. But it is also precisely part of the greatness of the human mind to learn to consider vigorously and calmly its natural condition, and courageously to seek to remedy it. We distinguish, for our part, even in the order of nature, two things, faith and science, the object of the one being to supplement the other. There is a natural, practical, and moral faith in the existence of a Deity, which no demonstration can equal, to which no reasoning is adequate.[1] But if the soul needs to believe, it also needs to know; it will try to unfold the causes of things

[1] 'A single sigh towards the future and the better,' it is admirably said by Hemsterhuys, 'is a more than geometrical demonstration of the Deity.' (*Aristée*—'Œuvres d'Hemsterhuys,' ed. 1719, vol ii. p. 87.—See, on the curious philosophy of Hemsterhuys, the work of M. Em. Grucker, Paris, 1866.)

by the laws of reason; and it is one of the strongest temptations of the human mind to equalize its knowledge with its faith, *fides quærens intellectum.* Hence the necessity of applying the abstract and discursive methods of science to what it would seem ought only to be an object of love and hope; even this, as it seems, has something disrespectful in it. The demonstration, even were it as affirmative as possible, is itself a failure of respect, for it calls in question what it is sought to demonstrate. *An Deus sit?* says St. Thomas Aquinas at the beginning of the Summa; and, faithful to the Scholastic method, he first replies, *Dico quod non.* But who guarantees this holy theologian that he will retrieve at the end of his argument what he has denied at the beginning? If he is sure of it beforehand, why does he make a show of seeking it? Does he only reason, then, for form's sake? Let him be silent, then; let him pray, let him preach, but let him quit this two-edged weapon, which must not be played with.

But this is an impossibility. No believer will renounce the temptation to demonstrate what he believes; and though he wished to do so, he would soon be forced to it by attack. Hence the application of the cold methods of science becomes necessary, and with science there appears all the difficulties inherent in the employment of these methods. Hence he who employs them has the perfect right to proportion affirmations to evidence, according to the rule of Descartes. As a philosopher, I am bound to but one thing: to admit as true what appears to me evident, nothing more. That there should be a very great difference between the demonstrations of science and the instincts of faith, is self-evident; for an adequate demonstration of the Deity, of His existence and essence, would imply a reason adequate thereto. The absolute reason can alone know the absolute being as He is. If, then, faith, anticipating this impossible knowledge, gives us moral certainty, science can only give a relative approximate knowledge, subject to revision in another state of knowledge, but which for us is the mode of representation the most adequate

to which we could attain. When Bacon said that we only know God by a refracted ray (*radio refracto*), this expression, admired by all, just means that the idea we have of Him is inadequate, without, however, being untrue—as the projection of a circle is not a circle, although it faithfully reproduces all its parts.

Let us return to the question stated at the opening of this chapter: Is the existence of ends in nature equivalent to the existence of a supreme cause, external to nature, and pursuing these ends consciously and with reflection? The demonstration of such a cause is what is called in the schools the *physico-theological* proof of the existence of God.

This proof, as is known, has been reduced to a syllogism, whose major is, that all order, or, strictly speaking, all adaptation of means to ends, supposes an intelligence, and whose minor is, that nature presents order, and an adaptation of means to ends.

We have hitherto confined ourselves to the analysis and discussion of the minor.

There still remains the major proposition of the argument. Finality being a law of nature, what is the first cause of that law? That cause, says the traditional voice of the schools, from Socrates to Kant, is intelligence; therefore there is a supreme intelligent cause. Is this conclusion legitimate? Such will be the object of the second part of this treatise.

CHAPTER I.

THE PHYSICO-THEOLOGICAL PROOF.

IN one of his most profound comedies, Molière makes a simple and pious valet give a lesson of theodicy to a sceptical and railing master. He makes the good Sganarelle speak thus to the unbelieving Don Juan: 'I have not studied like you, thank God, and no one could boast of having ever taught me anything; but with my small sense, my small judgment, I see things better than books, and understand very well that this world that we see is not a mushroom that has come of itself in a night. I would ask you, Who has made these trees, these rocks, this earth, and yonder sky above? and whether all that has made itself? . . . Can you see all the inventions of which the human machine is composed, without admiring the way in which it is arranged, one part within another? these nerves, bones, veins, arteries, these . . . these lungs, this heart, this liver, and all these other ingredients that are there, and that . . . My reasoning is that there is something wonderful in man, whatever you may say, and which all the savants cannot explain.'[1]

Under this comic and simple form, Molière sets forth the most striking and oldest proof of the existence of God, that which persuades most men, and which philosophers have called the proof from *final causes.* It is this argument that Fenelon develops so amply and eloquently in his treatise on the *Existence of God;* that Cicero before him had set forth, almost in the same words, in his *De Natura Deorum;* and that Socrates appears to have first employed; and which Kant himself, even while criticising it, never mentions without respectful sympathy.

[1] *Le festin de Pierre,* act iii. sc. 1.

This classical and traditional proof has been set forth a thousand times under the most varied and sometimes the most piquant forms. Let us give some examples of them.

The illustrious Kepler, whose soul was as religious as his genius was powerful, found everywhere material for philosophic or scientific reflections. One day, when he had long meditated on atoms and their combinations, he was, as he himself relates, called to dinner by his wife Barbara, who laid a salad on the table. 'Dost think,' said he to her, 'that if from the creation plates of tin, leaves of lettuce, grains of salt, drops of oil and vinegar, and fragments of hard-boiled eggs were floating in space in all directions and without order, chance could assemble them to-day to form a salad?' 'Certainly not so good a one,' replied his fair spouse, 'nor so well seasoned as this.'[1]

A Scottish philosopher, the wise Beattie, formed the ingenious idea of putting in operation the proof of final causes, to inspire his young child with faith in Providence. This child was five or six years old, and was beginning to read; but his father had not yet sought to speak to him of God, thinking that he was not of an age to understand such lessons. To find entrance into his mind for this great idea in a manner suitable to his age, he thought of the following expedient. In a corner of a little garden, without telling any one of the circumstance, he drew with his finger on the earth the three initial letters of his child's name, and sowing garden cresses in the furrows, covered the seed and smoothed the earth. 'Ten days after,' he tells us, 'the child came running to me all amazed, and told me that his name had grown in the garden. I smiled at these words, and appeared not to attach much importance to what he had said. But he insisted on taking me to see what had happened. "Yes," said I, on coming to the place, "I see well enough that it is so; but there is nothing wonderful in this,—it is a mere accident," and went away. But he followed me, and walking beside

[1] Al. Bertrand, *Les fondateurs de l'astronomie moderne*, p. 154.

me, said very seriously: "That cannot be an accident. Some one must have prepared the seeds, to produce this result." Perhaps these were not his very words, but this was the substance of his thought. "You think, then," said I to him, "that what here appears as regular as the letters of your name, cannot be the product of chance?" "Yes," said he firmly, "I think so." "Well, then, look at yourself, consider your hands and fingers, your legs and feet, and all your members, and do not they seem to you regular in their appearance, and useful in their service? Doubtless they do. Can they, then, be the result of chance?" "No," replied he, "that cannot be; some one must have made me them." "And who is that some one?" I asked him. He replied that he did not know. I then made known to him the name of the great Being who made all the world, and regarding His nature I gave him all the instruction that could be adapted to his age. The lesson struck him profoundly, and he has never forgotten either it or the circumstance that was the occasion of it.'

Let us now pass to Baron d'Holbach's drawing-room, to a company where each one outvied the atheism of his neighbour so as to scandalize Duclos himself; let us hear Abbé Galiani, the witty improvisatore, so fond of paradox that he did not fear to defend God against his friends the Encyclopedists. Here is the scene, as reported by Abbé Morellet: 'After dinner and coffee the abbé sits down in an arm-chair, his legs crossed like a tailor, as was his custom, and, it being warm, he takes his wig in one hand, and, gesticulating with the other, commences nearly as follows: "I will suppose, gentlemen, that he among you who is most fully convinced that the world is the effect of chance, playing with three dice, I do not say in a gambling-house, but in the best house in Paris, his antagonist throws sixes once, twice, thrice, four times—in a word, constantly. However short the duration of the game, my friend Diderot, thus losing his money, will unhesitatingly say, without a moment's doubt, 'The dice are loaded; I am in a bad house.' What then, philosopher?

Because ten or a dozen throws of the dice have emerged from the box so as to make you lose six francs, you believe firmly that this is in consequence of an adroit manœuvre, an artificial combination, a well-planned roguery; and seeing in this universe so prodigious a number of combinations, thousands of times more difficult and complicated, more sustained and useful, etc., you do not suspect that the dice of nature are also loaded, and that there is above a great rogue, who takes pleasure in catching you."'

It were useless to multiply the different examples whereby it has been sought to bring home the force of this proof, and which are all of the same mould.[1] The most ancient known form is that of throwing the twenty-four letters of the alphabet, which, according to Cicero, Fenelon, and so many others, could not produce a single verse of the *Iliad.*[2] In a word, the stress of the proof is that chance will never produce a regulated work.

This last form of the proof,—namely, the throwing of letters of the alphabet,—while it gives it the most striking appearance, is yet at the same time the very thing that supplies the objection. We know, in effect, that chance is not impossibility. A thing may only happen by chance, and yet happen. For this it suffices that it implies no contradiction. There is no reason why the figures composing the date of the accession of Louis XIV. (1643), that of his personal government (1661), and that of his death (1715), should always form the same number (14), and that this number should be precisely that of his rank among those of his name (Louis XIV.); and yet, however improbable these coincidences, they have occurred, and no one will seriously suppose that Providence amused itself with this kind of game, like a philosopher who should

[1] One may quote, however, the instance give by Tillotson in one of his sermons: 'If twenty thousand blind men were to set out from different places in England remote from each other, what chance would there be that they would end by meeting, all arranged in a row, in Salisbury Plain?'

[2] It is not known who first employed this argument. Perhaps the germ of it may be found in a passage of Aristotle, *De Gen. et Corrupt.* i. 2.

bethink himself of playing the juggler for recreation. The improbable may happen, then,—only it happens very seldom, and, for instance, the like coincidences would not be found in the history of all kings. But we know that, to reach a given combination, the more frequent the throws the more probable becomes the event. We know that mathematical calculation can determine the degree of probability of each event, and that it is equal to a fraction whose denominator expresses the totality of the chances, and the numerator the number of these chances, a number which augments with the number of the throws. Starting from this datum, one can calculate what chance there would be, by drawing the letters of the alphabet one after the other, of producing the verse of the *Iliad*. If, then, we threw the letters the given number of times, the production of the verse of the *Iliad* would not only be possible, but certain. This is evidently a concession that must be made to the opponents of the argument.[1] They will

[1] M. Charpentier clearly proves this in his ingenious treatise on the logic of probability, already quoted (p. 151). But he himself essays to prevail over the Epicurean argument by one of his own. That a fortuitous combination should take place once, he says, is not astonishing, and might even happen very certainly in the immensity of time; but that that combination should be reproduced a second and third time in succession, and even an infinite number of times, is what the calculation of probabilities does not allow us to admit. But the world exists from a time, if not infinite, at least indefinite; therefore the combination from which it results must have been reproduced continually, and is so still daily, which is inadmissible. Thus what opposes the Epicurean objection would not be the existence of the world, but its duration.—Despite the ingenuity of this objection, we do not regard it as decisive. The world, in fact, is not the repetition of a combination which recurs several times by different throws; it is one single combination, whose peculiar character is that, once found, it lasts just because it has in itself conditions of duration and stability. Given in effect a certain coincidence of distances and masses among the atoms, there will follow, for instance, a circular motion (that of the stars), which, in virtue of the law of inertia, will last eternally, so long as a new cause does not come to interrupt it; and so with the other conditions of regularity which we verify in the world. True, we may ask whether chance is capable of producing a world absolutely stable. But is the world, such as it is, absolutely stable? We do not know; and there may be such an unknown cause as will one day bring about its dissolution (for instance, the *law of entropy* of M. Clausius; see above, p. 161). If it were so, the world would have an end; it would then be, like all other combinations, unstable, only it would have lasted longer. But what are a thousand millions of years to infinitude?

not, however, have gained much by this; for to make these throws a hand and an intelligence were necessary. The types will not of themselves quit their cases to play at this game; once fallen, they will not rise to begin again. It follows, then, that the event in question is so improbable as to be practically equivalent to an impossibility. But is it the same if we pass from this particular case to the most general case possible—namely, to that of atoms endued with motion, and which have moved in empty space from infinitude? If the time is infinite, the number of throws may be infinite. In order, then, that a combination be produced, it is enough that it be possible. But the combination of which the actual world consists is possible, since it is; it must, therefore, infallibly be produced one day or other. This difficulty is very old: the Epicureans knew and made use of it. There was scarcely need to know the calculus of probabilities to discover it; it is an objection suggested by mere common sense. Fenelon sets it forth in these terms: 'The atoms, we are told, have an eternal motion; their fortuitous concourse must already have exhausted, during this eternity, infinite combinations. By infinite is meant something that comprehends all without exception. Among those infinite combinations of atoms which have already successively happened, there must necessarily occur all those that are possible. The combination of atoms that forms the present system of the world must, therefore, be one of the combinations the atoms have successively had. This principle being stated, need we wonder that the world is as it is? It must have taken this precise form a little sooner or a little later. We find ourselves in this system now.'

Fenelon replies to this objection of the Epicureans by denying that the number of combinations could be infinite, for, as he says, 'no number is infinite.' Given a number alleged to be infinite, I can always subtract a unit from it; then it will become finite. But if it is finite minus a unit, it cannot be infinite plus a unit, otherwise it would be this very

unit that made it infinite. But a unit is itself something finite. Now the finite added to the finite cannot make the infinite. So to any number whatever I can add a unit; therefore it was not infinite before the addition of that unit. From this reasoning it follows that no number actually realized can be infinite, and that, consequently, the number of combinations of atoms cannot be infinite. The principle being overthrown, the conclusion falls along with it.

I do not know that this argument of Fenelon, even granting its principle,—namely, that no number could be infinite,—I do not know that this argument hits the mark, and am inclined to believe that it would rather strengthen the Epicurean objection. In fact, the strength of this objection is not in the hypothesis of an infinite number of combinations, but in the hypothesis of an infinite time permitting the atoms to take all possible combinations. But this combination is possible, since it is. It matters little, therefore, whether the possible number of combinations be infinite or not; rather, if the number be finite, there is more chance that this in which we are should happen during infinite time. Suppose, in short, that there were only a thousand combinations possible (that in which we are being one of the thousand, which is proved by the fact that it exists), there will be a greater chance that this combination should occur than if there were a million, a thousand millions, an infinitude of possible combinations. The more you multiply the number of possible combinations, the more surprising do you render the realization of the actual one—so much so, that even with infinite time we question whether such a combination must necessarily happen, which Fenelon too easily grants. To suppose the world to pass successively through all possible combinations, and that it passes through them all in turn, is to suppose a certain order, a certain plan in the course of the combinations, which contradicts the idea of chance. It is clear that it might pass very often through similar combinations, that those recurring most frequently will be the easiest, that those in which there is a

very complicated combination (were they strictly possible) will only occur with great difficulty, and, despite infinite time, have an infinite chance against their realization. One can bet, then, in a manner, the infinite to one that the present combination will not be realized, however considerable may be the series of ages.

But let us lay aside the calculation of probabilities, and let us touch the Epicurean argument at the really sensitive part. The strength of this argument consists in supposing that the actual combination forms part of the series of possible combinations of atoms. It is possible, we are told, because it is. I say that this is to beg the question. The question, in short, is whether the world is possible without an intelligent cause. Those who deny it maintain that one of the elements of the combination is just intelligence, so that if this intellectual element be suppressed, the world ceases to be possible. Is it not as if it were said: This picture is possible, because it is; it has, therefore, had no painter. I deny it; for without a painter the picture is not possible. Logical possibility and real possibility are here confounded. What implies no contradiction is possible logically. But a given combination of colours (for instance, a given picture) implies no contradiction, since it is; it is, then, logically possible. But to pass from this logical to the real possibility, do we not need a precise cause, a determinate agent? This is at least what we allege, and it is to resolve the question by the question, to deny the condition that is the object of the debate, by affirming *à priori* a possibility which we only grant upon this same condition.

Besides, it is still a question whether the actual world would have been possible, if the elements of which it is composed had not been chosen and prepared precisely that the world might exist; so that if we suppose, on the contrary, any unprepared elements, the actual combination would become impossible. In fact, in order that a composed and combined work may be effected, indeterminate materials,

indifferent to any form, do not suffice; there are needed particular materials, form, and arrangement. To make a table, for instance, pieces of wood of any form—spheres, cubes, pyramids, or any other solids, more or less regular—do not suffice; wood cut into planks is needed. So to compose a line of print, little pieces of copper or lead do not suffice; characters—that is, letters—are required. If the materials are not appropriate to the thing to be realized, in vain will they have moved during infinite time. They will not produce that work; for them it is outside of possible combinations; it is incompatible with their essence. Grains of gold moving without end during infinite time will never make a blade of grass.

I say, then, that to render the present world possible, the first elements of which it is composed must have such a determinate essence that precisely this may be in the number of possible combinations of these elements. I even add, that to speak of other possible combinations than this is a bad expression, for all that results, or can result, from the essence of the elements forms part of the actual combination. By *universe*, in fact, I mean the whole of the phenomena, past, present, and future, which have followed from the first throw of the elements. There has never, then, been more than one combination;[1] and from the first cast the present world was found without groping and without throw of dice. There has only been one cast, and that is the harmonious and regular world of which we see but one moment and one face, but which embraces in its unity all the faces and moments the imagination can conceive. To imagine another world, other combinations, we must suppose, if possible, other elements, but which have never been realized and never existed, otherwise the present world would itself never have

[1] This assertion in no way contradicts the doctrine of free will; for free will is not exercised at the expense of the laws of nature, and cannot change the essential conditions of the actual combination: it only shows itself in the very sphere of these conditions.

existed, since it is only compatible with some elements and not with others.

Hence it follows that the alleged infinitude of combinations, from which all at once the present world resulted, implies a contradiction, and that from the first moment it was already the present world (not the phase in which we form part, but an anterior phase bound to this). The present world exists, then, from all eternity (if it exists of itself), and there never have been others. There is room for the inquiry how such a world, so regular and wise, has alone succeeded in existing among so many other worlds that might have been; and if it be said that no other than this could exist (which, for the rest, we do not know), the question will still remain, how the only possible world is precisely that in which order, harmony, and reason reign.

Let it not, meanwhile, be supposed that the question can be resolved by applying to the formation of worlds the Darwinian principle of the struggle for existence, and natural selection. It is the same with worlds, it might be said, as with living species; the best organized is the most durable, and, among all possible, that alone has endured which has been found possessed of conditions of stability. The comparison is quite false. A species, in order to last and live, needs to be adapted to a medium. That will be the most durable in which most adaptation shall occur; that in which none at all is found will only last a moment, or even will never exist. But the world has not to be adapted to a medium, since it is itself the whole. What need has it to be organized, harmonious, and regular? And why should it not subsist in the state of chaos? For the totality of things, the absence of order and regularity is not, as in the case of living species, a principle of destruction. The materials being eternal and necessary, what matters it whether they be in one order or in another, or even though they have no order at all? they will exist none the less. Thus a chaos has not less chance of existing than a cosmos. In the competition of the

possibilities of being, the one is equal to the other. No doubt Leibnitz has justly said that in this competition of possibles, perfection is the cause of choice; but this is precisely because he occupies the point of view of the final, and not of the material cause. From a purely material point of view all the possibles are equal, and selection can do nothing in it. Hence my question recurs: How is the only world that has managed to exist precisely the world of order and harmony?

Besides, the Epicurean objection, if it were accepted, would go much farther than is imagined. If all is the product of chance, it must be admitted that not only the intentional order of nature, but even physical and mathematical order, is purely fortuitous and contingent; for, once upon this path, why should it not be supposed that it is chance that produces an apparent constancy in the laws of nature, like, for example, the constancy of chance in the case of a lucky gambler? There are no laws, it will be said, but simple coincidences which hitherto have been more frequent than others. The order of things would then have no more value than their goodness, and science would be as arbitrary as esthetics. But no one goes so far. On the contrary, it is in the name of science and of the laws of nature that finality is opposed; but if it is not believed that chance can produce laws that have full mathematical rigour, why should it be admitted that it can produce the appearance of order and wisdom?

But let us not insist on an argument now antiquated, and which no one really any longer maintains, which, besides, taken strictly, would carry us much farther than any one wants to go. From the point where the discussion was in the days of Fenelon, let us come to the point where it is at present,—that is, the point to which it has been brought by the criticism of David Hume, Kant, and Hegel.

Kant reduces the physico-theological proof to the different points that follow:—1st, There are everywhere in the world manifest signs of an order regulated by design; 2d, This

harmonious order is not inherent in the things of the world, it only belongs to them contingently; 3d, There exists, therefore, one sublime wise cause (or more), which must have produced the world not only as an omnipotent nature acting blindly by its *fecundity*, but as an intelligence by its *liberty;* 4th, The unity of this cause is deducible from that of the mutual relations of the parts of the world viewed as the different pieces of a work of art.

Kant begins by mentioning and setting aside one of the chief difficulties, which he himself, however, seems to consider a cavil here, but which, in the *Critique of the Judgment*, and in the later German philosophy, becomes the point of departure of an entire revolution in the conception of finality. '*We will not here cavil* with natural reason,' he says, 'on this argument, in which, *founding on the analogy of some productions of nature with the products of human art, it concludes that nature must have as its principle a causality of the same kind.*' This analogical reasoning is what we have hitherto made use of to prove natural finality; but to defend ourselves against the very objection of Kant, we have taken care only to make use of it to prove the *existence* of this finality, and not to explain its *cause.* Analogy can serve as a clue while only nature is concerned; whether it can also enable us to pass beyond nature is quite another question. However, since Kant himself here sets aside this difficulty as a cavil, this is not the time to raise it, and we will revert to it at the fit time and place.[1]

This difficulty being adjourned, there remain two objections urged by Kant against the proof of final causes. The first is that that proof, if it were considered as valid in itself, would only demonstrate that there is an *architect* but not a *creator* of the world,—that it is the *form* of the world, not its *matter*, that is contingent. To prove the contingency of the matter of the world would need an entirely different argument than this.

[1] This will be the object of the two following chapters.

Thus, according to this first objection, the argument would indeed prove, according to Kant, that the form of the world is contingent,—that is, supposes a cause,—but it does not prove this of the matter. The distribution of the elements, and their co-ordination according to a plan, would suppose a cause; but as to the elements, the very atoms composing the material of the world, nothing proves them to have a cause, and that they do not pre-exist necessarily and eternally.

The second objection is, that the argument, resting only upon experience,—that is, upon imperfect, contingent, and limited things,—can only infer a *proportionate* cause; in other words, a cause which is itself relative and imperfect. One can only rise to a *very* wise, *very* skilful, *very* powerful cause; and it is only by imperceptibly changing the argument that we infer an *entirely* wise, *entirely* skilful, and *all* powerful cause. 'The physico-theological proof, then, finds itself arrested in the midst of its undertaking; in its difficulty it leaps of a sudden to the cosmological proof, which is itself only a disguised ontological proof. . . . After having gone a good way on the ground of nature and experience, the partisans of this proof suddenly abandon this domain, and rush into the region of pure possibilities.' The conclusion is that the proof of final causes only gives us a *relative* and *indeterminate* cause, and leaves us in complete ignorance as to its nature; for 'there is no determinate concept but that which comprehends all possible perfection, and it is only the whole (*omnitudo*) of reality that is completely determinate.'

It has been generally agreed, even in the modern spiritualist school, to accept the two preceding objections. It has been acknowledged that Kant has clearly limited the range of the proof of final causes, and that we must have recourse to other proofs to complete the demonstration.

The masters of eclectic spiritualism, M. V. Cousin and M. Emile Saisset, express themselves on this question as follows:—

'We are not afraid of criticism for the principle of final

causes,' says M. Cousin,[1] 'but we believe, with Kant, that its range must not be exaggerated. In fact, the harmony of the phenomena of nature only proves an architect of the world. One may admit a supreme architect, and deny that he can be the creator. These are two entirely different things. In the second place, if we do not pass beyond the argument of final causes, that greatness of the worker which we conceive proportionate to his works is quite indeterminate, and experience will never give us the idea of the omnipotence, perfect wisdom, and absolute unity of the supreme author.' 'These objections are valid,' says M. Emile Saisset;[2] 'this dialectic is irrefutable; but what does it prove? Not that the argument from final causes is false, but that it is insufficient; not that it must be despised or rejected, but that it should be confined to its just range. It does not prove the existence of the creator; it does not even prove the existence of an infinite intelligence; but it serves powerfully to confirm it.'

Perhaps it is a little presumptuous to try to gain back from Kant, if not all, at least a part of what such wise philosophers have thought it their duty to yield to him. Still let us try. I shall not insist on noticing how inexact it is to blame an argument for not proving what it is in no way meant to prove. The proof of final causes does not aim to prove the creation of the world; it might as well be criticised because it does not prove the immortality of the soul. There is a time for everything, and in good logic we ought to ask of every proof only what it promises. The existence of God is one thing; creation is another. One may admit a God without admitting creation *ex nihilo*. Plato, Aristotle, and the Stoics admitted the existence of God, without knowing anything of the dogma of creation. Does the physico-theological argument prove, or does it not, an intelligent cause of the world? That is the whole. If it does, the argument is good, even if it did not prove a creating God, nor even a God absolutely

[1] *Philosophie de Kant*, 6e leçon, p. 217.
[2] *Philosophie religieuse*, 2d ed. t. ii. Appendix.

perfect. That will be matter for another discussion. The two objections of Kant, then, as it seems to us, fall into the sophism of the *ignoratio elenchi.*

But we will try to go farther, and to prove that Kant's two objections cannot subsist together, that they destroy each other, and that of the two difficulties raised at once, one only can exist.

If, in fact, it be maintained that God is only the architect of the world, and that only the *form* of things is contingent, that means that *matter* is not so. If matter is not contingent,—that means that it is necessary,—it exists of itself, it has in itself the reason of its existence; this is the datum of the objection. But if we suppose matter to be necessary, for the same reason we must suppose the cause that gives the form to be necessary, on the same ground as the matter itself, and that it is self-existent. How, in short, can it be admitted that a non-necessary cause would have the power to act on a necessary matter, and to give it orders? If matter has not the principle of order and harmony in itself, how should that principle be found in an external and contingent cause? If that organizing cause were contingent, whence would it have derived the reason of its existence? This could only be in the self-existent matter; but how can it be supposed that a cause, deriving its existence from matter, should be capable of modifying and transforming it, and imprinting order and harmony upon it? Would not this be as if it were said that matter had given these to itself, which the objection ought not to assume? This cause does not, then, proceed from matter; it is, therefore, self-existent, or is derived from a self-existent cause. Notice besides, that the *processus in infinitum* would here avail nothing, for by hypothesis the matter supposed necessary is also a last term; therefore, on the other hand, the cause must likewise have a last term.

From this it follows that the organizing cause of the world is a cause by itself,—that is to say, that it is an absolute cause; for absolute means nothing else than what is self-

sufficient, what has need of nothing else to exist. It is what Kant calls the unconditioned, what does not presuppose any condition; the τὸ ἀνυπόθετον of Plato. The hypothesis of necessary matter, contained in the objection, puts us in possession of the idea of the absolute; and once in possession of this idea, we are entitled and even constrained to suppose it in the cause as well as in matter.

But then it is evident that the first objection destroys the second. What was the latter? This, that from a contingent world we cannot rise to an absolute cause; that there is not in the world material enough to make a primary being sufficient for all. But the first objection, by the hypothesis of a pre-existent—that is, necessary—matter, furnishes the material of the absolute idea of which I have need. If the first cause is absolute, it will be so in all its attributes: being by hypothesis intelligent, it will be omniscient; being powerful, it will be omnipotent; being good, it will be perfectly good, and so on. Will it be said that this cause is not absolute because it only organizes, not creates, and that it is limited by the matter on which it acts? But if there were some contradiction here, it would rather belong to the objection than to the argument itself, and we would very soon be brought to conclude that a cause cannot be absolute without existing alone, which would destroy the hypothesis of a pre-existing matter. We may affirm, then, that the Divine Architect would very speedily and inevitably lead to the Divine Creator. But without pressing this conclusion, suffice it to remark, that matter does not limit the first cause in its essence, but only in its action; that God could still be, for instance, the *good in itself* of Plato, the *pure act* of Aristotle, while yet only as regards the world organizer, and not creator, which would amply suffice.

Let us, meanwhile, reverse the hypothesis; let us grant the second objection: it will be evident that it destroys the first. The world is contingent, we are told; therefore we ought only to infer a contingent and relative cause. Be it

so; but if the world is contingent, it is so entirely, both matter and form, for what right would there be to infer from the contingency of the form the necessity of the matter? There will thus be no necessary matter. The cause of the world may be contingent, relative, imperfect, whatever you please, but it will be the entire cause of the world, without sharing with a pre-existent matter. Perhaps it would be too much to call such a cause creative, but it would not be enough to call it merely organizing. In fine, it would be the sole cause that could be required on this hypothesis, and nothing more could be asked for a demonstration.

The truth is that, according to Kant, the organizing cause is not only contingent, relative, and imperfect—it is indeterminate to the extent that it cannot even be said whether it is *one* or *several;* and the heathen did not reason so badly in admitting the plurality of gods. Seeing, in short, means and ends, but ends that did not mutually agree, they supposed as many causes as they saw categories of ends. Hence *polytheism*, which appears a legitimate product of the hypothesis of final causes. It is the same with Manichæism. The world consisting of good and evil, order and disorder, in strict reason it seems quite as legitimate to infer an evil cause as a good one, or else an indeterminate cause, neither good nor bad, and of which nothing is known but that it is.

We are far from saying that there is no share of truth in these objections, but we need not admit more than is necessary. And here again this part of the objection may be circumscribed.

First, should it be said, strictly speaking, that we have still the right at the present day to infer Manichæism or polytheism, I will ask, then, why humanity has ceased to be polytheistic and Manichæan in proportion as it has become more enlightened. No doubt polytheism might be historically a plausible and relatively legitimate hypothesis. It is infinitely superior to fetishism and to coarse mechanism. Doubtless it is a first glance at nature, a first interpretation of the

phenomena—an interpretation sufficiently acceptable in relation to the knowledge of the epoch. But in proportion as nature has been studied, all these apparently divergent effects have been seen to converge towards one centre, all these ends to co-ordinate themselves to form one whole, and show themselves with admirable harmony. The stars and the earth have been seen to be connected by bonds and common motions, to show even a common substance, for we find in the sun the elements of our mineral world. We see by the progress of the sciences all the classifications of causes being gradually simplified. Thus, in the scientific world, polytheism disappears,—that is, the hypothesis of several causes is constantly giving place to unity. Hence we need not wonder that humanity at last came to understand that it was to take imaginary beings for realities, to create as many gods as phenomena, and that we must not multiply beings needlessly. If, then, there is an intelligent cause of the world, it must be one. The same holds as to Manichæism. Here experience is less advanced than for the multiplicity of causes. No doubt we are far from having explained all in the world that is called evil. There remains a certain latitude allowed the hypothesis of something bad or impotent in the first principle, if, that is, one occupy the point of view of experience alone. And yet, even from this point of view, it may be said that the hypothesis of an evil or impotent principle has been, at the very least, driven back. Have not a great many phenomena considered pernicious been reduced to phenomena conformable to the order of things? Did not the idea of a wicked and cruel God arise at the first from the contemplation of volcanoes, comets, and all that, being unexpected, strikes the senses or threatens the life of men? Yet we now know that many of these phenomena are innocent, and that they only differ by intensity from the most simple that continually surround us and that have nothing pernicious in them. The eruption of a volcano is no more extraordinary than the boiling over of water in a kettle. The lightning that throws down buildings, splits and

plucks up trees, is like the electric spark with which we play. In fine, apart from pain, no phenomenon can strictly be called a disorder of nature; consequently there is in it nothing to indicate a pernicious and unreasonable power. Coming to pain, the explanation presents more difficulty; yet it cannot be denied that the studies of philosophers and moralists have at least singularly diminished the force of the argument. It is known to be often a salutary warning, a necessary stimulus to human activity, an incitement to the progress of the human race. Pain can thus be explained to a certain extent from the point of view of final causes. As to moral evil, it is a phenomenon of an order so different, and so entirely beyond what we have hitherto been studying, that we are warranted to set aside this aspect of the question. We only remark that, when we see evil restrained in society as the result of the progress of manners and ideas, we find here again, if not a solution, at least a diminution of the difficulty. Thus apart from objections *à priori*, which are decisive against Manichæism, and even from the point of view of experience, from which this doctrine might still derive some support, we see that a certain number of phenomena, which at first appeared most favourable to the idea of a pernicious power, have admitted of explanation. We are, therefore, entitled to suppose that the others will be explained in the same way, or would be explained if the order of things were better known.

Kant further objects to the proof from final causes as powerless to give us a God *apart from the world*, or at least to rise to this, except by illegitimately going beyond itself, and surreptitiously borrowing the aid of the ontological or cosmological proof. But here again, as we think, there is a confusion of ideas.

What is meant by these words, *apart from the world?* Is it simply, not forming part of the chain of finite and contingent beings that we seek to explain? In this sense it is evident, in fact, that the cause of the world is apart from the world. The world comprising all the things of experience,

none of these things is qualified to be, more than another, the universal cause; the cause of the world, behoving to be adequate to the entire series of the phenomena, cannot be confounded with any of them in particular. In this sense the distinction of the world and its cause is incontestable, and rests simply on the principle of causality, in virtue of which the cause is distinct from its effect. But if now by this expression, *apart from the world*, there is meant a more profound distinction and separation,—for instance, a distinction of substance,—such a distinction, in fact, transcends the data of the physico-theological proof, but no more is it required by the question. The existence of an intelligent cause of the universe is one thing, the transcendence or immanence of that cause is another. Even if we admitted, with the Stoics, a soul of the world, an active principle of which nature would only be the passive side, God would be none the less an intelligent cause of the universe; and if the proof goes no farther, it goes at least this length, and that is the only thing in question at present.

Metaphysicians are too often in the wrong in setting up the deadly maxim of radical politics—all or nothing. They do not sufficiently admit what may be called the current coin of truth. A half, third, or quarter of the truth has no value in their eyes, if all they ask be not granted them. However, there is a medium between knowing all and knowing nothing; and in every question, between the extreme terms there are many degrees. Between the hypothesis of a nature produced by chance, and that of a supreme cause absolutely perfect, there may be many shades of opinion, of which none is to be despised. That nature supposes an ordering principle is a truth of first rank, whatever else may be the more or less extended meaning that may be given to this principle. The criticism of Kant, despite the two objections set forth, allows this proposition, in its essence, to stand; and on this ground it could not prevent our discussion from advancing a step. From finality, considered as a natural law, we have passed

to its cause, and to an intelligent cause. What are the degree and nature of this intelligence? Is it interior or exterior to nature? This is what remains in suspense; but that which has been gained would be none the less of great value.

Kant, however, believes that there results from the discussion instituted by him a critical conclusion much graver than what we have just indicated,—namely, that the proof in question only supplies us with a *regulative,* not a *constitutive,* principle,—that is, that this proof suggests to us, indeed, a hypothesis useful, in the course of scientific researches, for conceiving a certain systematic unity in nature, but not a real principle, corresponding to an effective and essential law of the nature of things.[1] But it happens that it is precisely in quality of a hypothesis regulative of scientific researches that the theory of final causes is useless or injurious. As a *rule,* then, it can be dispensed with. It is, on the other hand, in quality of *truth* that it is imposed upon us; but what is true is essentially constitutive. Besides, one does not see how this critical conclusion should result from the previous discussion. Because the cause of the world was only organizing, and not creative,—a relative, not an absolute cause, how should it follow that finality is only an idea, a rule, and has no relation to objective reality? However limited may be the field of finality, while the very basis of the argument is conceded, the extent of the conclusions may be limited; but one cannot change their nature, nor conclude from the real to the ideal. It is on the real that the physico-theological argument takes its stand. This basis not being disputed, the degree of the presumed cause matters little; uncertainty regarding the degree of the cause does not suffice

[1] It must not be lost sight of that our whole controversy at present only bears upon Kant's argumentation in the *Critique of Pure Reason,* and that we leave aside the doctrine of finality as it is set forth in the *Critique of the Judgment,* which will be the object of the following chapter. The only question debated here is whether, from the two objections above set forth, and which are all that Kant handles *ex professo* in the *Pure Reason,* it results that finality has only a regulative and not a constitutive value, as he affirms.

to transfer it from one order to another—from reality to ideality. Now, in the previous criticism, Kant did not make the discussion bear on the reality of the data (except in a parenthesis scarcely indicated), and only insisted on the disproportion between the latter and an absolute cause. But because that cause was not absolute, it would not follow that it was ideal.

It seems that there is a kind of contradiction in Kant's thought between what he at first grants to the physico-theological argument and the meaning he attributes to it in the end. 'It would be,' he says, 'not only to deprive ourselves of a consolation, but *even to attempt the impossible*, to pretend to take away something from *the authority of this proof*.' He here, then, accords to this proof at least a practical and instinctive value, which cannot be diminished 'by the uncertainties of a subtle and abstract speculation.' However, if this proof is limited finally to furnishing us with a rule for the interpretation of nature,—if it is only a 'convenient and useful hypothesis, which, in any case, can do no harm,'—the authority of the argument as a proof of the existence of God absolutely disappears.

Kant tells us that if the principle of final causes were constitutive (that is, objective), and not simply regulative (that is, hypothetical), the consequence of it would be *inactive reason* (*ignava ratio*). The investigation of nature would then be regarded as completely achieved, and reason would give itself to repose, as if it had accomplished its work; the ends of nature would free us from investigating its causes, and we would be led to recur too easily to the unfathomable decrees of the divine wisdom. But it seems to us that this difficulty rather bears against Kant himself than against the opposite doctrine. If finality is nothing else than a principle regulative of the scientific use of the reason, and the anticipated expression of the unity of nature, we will then be tempted everywhere to assume unity and ends, and will be so much the less inclined to refrain from this, that we will

always be able to say to ourselves that it only regards provisional and conventional hypotheses. If, on the other hand, the theory of final causes has only a theological, and not a scientific value—if it regards not the immediate explanation of the phenomena, but their last reason, wherein can the doctrine of a creative or ordering intelligence injure the sciences and the study of nature? On the contrary, as we have often said, the assumption of ends can in no way oppose the investigation of causes, since there can only be ends if there are causes. How could a means be *fit* for an *end*, if it were not at the same time a *cause capable* of producing that *effect?* In an experimental and scientific point of view, then, it will always be possible to place the end out of account in investigating nature, and the doctrine of a supreme cause will no more encourage inactive reason than any other. Whatever hypothesis may be formed as to the principle of things, inactive or adventurous minds will always be able to dispense with the study of particular laws and immediate causes by a recourse to the first cause. It will be said, for instance, of a given phenomenon, that it is a mode of motion, and thus one will avoid determining what mode of motion it may be, and according to what law it is governed. 'The laws of nature' will be appealed to as immoderately as is the divine wisdom in another camp. Reciprocally, a partizan of the divine wisdom is as well entitled as any other to place that conception out of account in the study of the particular laws of nature. Thus the fault in question may be common to both sides, and both sides also can escape it.

It results from the preceding discussion that the objections raised by Kant in the *Critique of Pure Reason*, against the proof of final causes, only touch, after all, the accessory part of the argument, and leave intact the essence—namely, that order implies intelligence. But this is only the first assault of modern criticism; the argument has still to undergo many trials before emerging intact from the fire of debate, as will be seen in the following chapters.

CHAPTER II.

SUBJECTIVE AND IMMANENT FINALITY.

THE knot of the argument of *final causes* so called, or physico-theological argument, is in this major proposition of Bossuet: All order, that is, all proportion between means and ends, supposes an intelligent cause. But here also lies the radical difficulty of the argument. That the order of nature, the finality of the world, supposes a specific, appropriate principle may be allowed; but is that principle necessarily an intention, a will, a free reflection, capable of choice? This is another question, and a new object of dispute.

That is not all. Does the finality assumed in nature really belong to nature,—is it real, objective, or might it not be a form of our mind, a tendency of our feeling,—in a word, a hypothesis more or less useful and convenient for forming our ideas of things, but not an essential, real law, true in itself, as the veritable laws of nature behove to be? Finally, for a third difficulty. Granting that finality must have a cause, still is that cause necessarily anterior and exterior to nature? May it not be precisely nature itself? Why should it not be of the essence of nature spontaneously to seek finality?

To these three questions correspond three solutions or hypotheses, which it is necessary to examine: the hypothesis of *subjective* finality in Kant; the hypothesis of *immanent*, and that of *unconscious* finality in Schelling, Hegel, and the whole German pantheism. Is finality subjective? Is it immanent? Is it unconscious? The two first of these questions will be the subject of this chapter, the third that of the two chapters following.

§ 1. SUBJECTIVE FINALITY.

In his *Critique of Pure Reason*, Kant had striven to limit and circumscribe the range of the physico-theological argument; but finally he seemed to admit the foundation of it, and, save a reservation of great importance, but hardly indicated,[1] he acknowledged that we are warranted to infer from the order of the universe an intelligent cause—in a word, the essence of the proof remained safe and sound. But it remained to examine the value of the principle itself, in virtue of which we thus reason. This new question he has examined in his *Critique of the Judgment*, and has resolved it in a much more problematic sense than he appeared to do in the *Critique of Pure Reason.*

How was Kant led to examine the principle of finality? He himself tells us. Because the principle of liberty, demonstrated in the *Critique of Pure Reason*, implied that liberty must realize in the sensible world the *end* set by its laws. In fact, the ideal conception of morality, according to Kant, consists in conceiving the maxim of each action as capable of becoming 'a universal law of nature.' This, again, was to suppose 'that nature does not exclude the possibility of ends that must be attained according to the laws of liberty. If nature were not, in fact, susceptible of ends, how could it contribute to the ends of liberty? Consequently there must be a principle, rendering possible the agreement of the supra-sensible, that serves as a foundation to nature, with the conception of liberty, and *which permits the mind to pass from the one world to the other.*'[2] In a word, the pure reason furnishes us with concepts sufficient to constitute nature, to render it possible. These concepts, which are the categories, and of which the principal is the concept of causality, teach us

[1] 'We will not here cavil with natural reason . . . etc.' (*Critique of Pure Reason*, Book ii. chap. iii. § 8.) See above, p. 332, and below, p. 359.

[2] *Critique of the Judgment*, Introd. § ii.

that there is a nature subject to laws; and that would suffice for the knowledge of this nature, and to give it a certain unity. But such a nature would still be possible, provided there were laws, even though these particular laws had no mutual relation, and should form separate systems. Only, on this hypothesis, how could we study it? We must, then, have something more. We need, in order to comprehend nature, and to study it with ease, to believe that it forms a system, an order, that the different parts are bound together. Hence these principles: 'Nature makes nothing in vain; nature acts in the simplest ways; nature takes no leaps. (The law of *continuity*, the law of *parsimony*, and the law of *the least action.*)' But all these maxims may be reduced to a fundamental rule—namely, 'that the particular laws of nature must be considered according to a unity, such as a mind would have established, which, in giving these laws, would have had regard to our faculty of knowledge, and have sought to render possible a system of experience founded on the particular laws of nature.' [1]

This passage from causality to finality, or from the *Critique of Pure Reason* to the *Critique of the Judgment*, will appear obscure to the reader; but it is because it is obscure in Kant himself. The principle of causality serves to constitute a nature in general, but without determining anything as to particular laws. The principles of pure physics might still be found applicable, even if one did not grasp any determinate law.[2] These laws are thus contingent, and are only discovered by observation. We, however, need a clue to study and comprehend them, and to give them a certain unity. This clue is the principle of finality—a principle necessary, as is evident, but essentially *subjective*.

Here we must guard against a misconception. In a sense

[1] *Critique of the Judgment*, Introd. § iv.

[2] For instance, the principle of the conservation of the same quantity of force and matter, the principle that external phenomena have an extensive quantity, etc., would remain true, even though the universe formed a sort of chaos without determinate laws.

it is correct to say that, in Kant's view, all the concepts of the reason and the understanding, save those of the practical reason, are subjective. It is known, in fact, that the forms of perception (space and time), and the laws of the understanding (cause and substance), are only the conditions proper to the mind in the study of phenomena. Thus they are subjective laws, since they are only the laws of our mind. But it is to be noticed that Kant never employs the word 'subjective' to express this meaning. He considers them, on the contrary, *objective* in this sense: that being laws absolutely necessary and universal, and from which no mind can free itself, they determine those phenomena to affect us as *objects*. What is universally and necessarily true is objective. Besides, these laws are *constitutive* in this sense, that the object is really constituted by them, that without them it would not be possible, nor would intuition, experience, or science itself.

It is not the same with the principle of finality. This latter is subjective in the proper sense of the word, and it is so even with reference to the preceding laws. These, in fact, being once regarded as objective, the human mind may besides have tendencies, dispositions, needs, which, without being necessary to constitute an object of experience or of science, are not only useful but indispensable to guide the mind in its researches. It is, then, if we may say so, a subjectivity in the second degree. These kinds of principles are *natural hypotheses*, ways of conceiving things, frames, *clues* for investigations; they are not constitutive, but *regulative* principles.

Kant never tires of repeating that the principle of finality has only a value of this kind. It belongs not to the *determining*, but to the *reflecting* judgment. The first, which is the scientific judgment properly so called, applies the law to particular facts, without any kind of liberty. The second, on the other hand, given a particular fact, seeks to bring it under a law, to reduce it to some general notion. This is about the difference that exists between science and philosophy. In the reflections we make on things, we need not see laws, but only

thoughts. Of this kind is the transcendental principle of finality: 'The judgment finds it in itself. . . . It does not prescribe it to nature, because it is true that our reflection accommodates itself to nature.' The converse is not true, and 'nature, for its part, is not ruled on the conditions according to which we seek to form a conception of it.' Thus, in judging, 'the faculty of judging thereby gives a law for itself, and not for nature.' In fact, 'we cannot attribute to nature itself something like a relation of finality, but only *make use of this conception* to reflect on nature.'[1] And further: 'This transcendental conception of a finality of nature is neither a conception of nature nor a conception of liberty, for it *attributes nothing to the object;* it does nothing but represent the only way in which we must proceed in reflecting on the objects of nature to arrive at a perfectly connected experience. It is thus a *subjective principle* (a maxim) of the judgment.' 'The judgment contains a principle *à priori* of the possibility of nature, but only *in a subjective point of view,* by which it prescribes, *not to nature but to itself, a law* . . . which it does not find *à priori* in nature, but *which it admits,* in order to render palpable the ordinance of nature.'[2] He adds 'that observation teaches us nothing of this law, although it may confirm it.' In fine, it is the very liberty of our mind in the application of this law that is the source of the pleasure we find in it.

Kant attributes this character of subjectivity to the two kinds of finality he has distinguished—esthetical and teleological finality, which he also calls *subjective* and *objective* finality respectively.[3] Speaking of the first,—that is, of the beautiful,—he distinguishes the *realism* and the *idealism* of

[1] *Critique of the Judgment,* Introd. § iv. [2] *Ibid.* Introd. § v.

[3] There are so many degrees of subjective and objective in Kant that one at last gets lost in them. Here the two species of finality are subjective in the sense we have just stated; but the one (the beautiful) is only the agreement of the object with our esthetic faculties. The other (finality properly so called—that of organized beings, for instance) is the agreement of the object with its concept. It has thus some foundation in the object itself.

finality. According to the first of these conceptions, the beautiful would be 'like a real end that nature proposes to itself;' according to the second, it would be 'only an agreement established without an end, of itself, and in an *accidental way*, between the faculty of judging and the forms of nature.' He adds that 'nature everywhere, in its free formations, reveals a mechanical tendency to the production of forms which seem to have been expressly made for the esthetic use of our judgment; and we do not find in it the least reason to suspect that anything more is needed for this than the simple mechanism of nature as nature, so that the agreement of these forms with our judgment may quite well be derived from that mechanism without any idea serving as a principle to nature.' If it is so in the formation of crystals, for instance, why should it not be the same for the production of the most beautiful forms? In fine, what proves that our judgments on the beautiful are eminently subjective is 'that, in general, when we judge of beauty, we seek in ourselves *à priori* the measure of our judgment. . . . It is we who receive nature with favour, not it that does us one.'[1]

Ought we now, according to Kant, to attribute more reality to the finality he calls *objective* (that is, what constistutes, properly speaking, the relation of means and end) than he attributes, as we have just seen, to subjective or esthetic finality? No; and it even seems that Kant attributes still less to it, for he says subjective finality still rests on some principle *à priori*, while objective finality (final causes properly so called) only rests on analogy. It is a 'problematic' principle, which one will do well to admit in the investigation of nature, but on condition that it shall only be made a principle of observation and investigation by analogy with the causality determined by ends, and '*that one shall not pretend to explain anything thereby*.'[2] Kant, however, acknowledges[3] that the objective teleological principle has also 'some foundation *à priori*,' not in so far as one considers 'nature in general as a

[1] *Critique of the Judgment*, t. i. § lvii. [2] *Ibid.* t. ii. § lx. [3] *Ibid.* § lxv.

collection of objects of sense,'[1] but so far as one considers 'an organized production of nature;' only, yet once more, it is 'a *regulative* principle,' '*a maxim.*' This concept, which has a foundation *à priori* in the mind, and a determining notion in the life of organized beings, extends at once to the whole of nature, and is legitimately generalized under this form: 'Nature makes nothing in vain;' but it is always 'subjectively,' as a 'maxim,' as 'a regulative, not a constitutive principle,' as a 'clue' in our researches, that we are allowed to admit it.[2] Even thus restricted, the principle of finality can only be warranted in the study of nature on condition of being again circumscribed within its own limits, and not complicated with another concept—that of God. Teleology must remain distinct from theology.[3] 'If we introduce into the science of nature the concept of God to explain finality in nature, and then make use of this finality to prove that there is a God, each of these two sciences loses its consistency.' Consequently, one must limit oneself to the modest expression, 'ends of nature,' before inquiring 'of the cause of nature.' If physics would confine itself within its own limits, 'it must set entirely aside the question whether the ends of nature are *intentional* or not. . . . It is enough that there are objects which can only be explained by taking the idea of end for a principle.' One can employ metaphysically, and for the convenience of use, the expressions, wisdom, economy, foresight of nature, 'without therefore making of it an intelligent being, which would be absurd, but also without venturing to place outside of it, as nature's workman, another intelligent being, which would be rash.'[4]

In fine, the doctrine of Kant is summed up, as it seems, most clearly in the following passage:—'It is impossible for us to explain organized beings, and their internal possibility, by purely mechanical principles of nature; and it may be

[1] *Critique of the Judgment*, § lx.
[2] All these expressions are contained in the same passage, § lxv.
[3] *Critique of the Judgment*, § lxvii. [4] *Ibid.*

boldly maintained with equal certainty that it is absurd for men to try any such thing, and to hope that some new Newton will one day be able to explain the production of a blade of grass by natural laws over which no design has presided, for that is a view which must be absolutely denied to man. But then, on the other hand, there would be great presumption in thinking that, if we could penetrate to the principle of nature in the specification of natural laws, we could not find a principle of the possibility of organized beings which would dispense with our referring their production to design; for how can we know that?'[1]

In a word, finality is a hypothesis, and even a necessary hypothesis, given the conformation of the human mind; but nothing warrants us to suppose that this hypothesis has an objective foundation in reality, and that an understanding that should penetrate to the very principle of nature would be still obliged to conform to it.

We do not entirely reject this doctrine of Kant. We even partly accept it, but on condition of interpreting it, and giving it a different meaning.

We distinguish two sorts of hypotheses,—one which may be called *objective* and *real;* the other *subjective* and *figurative.* In both cases, the hypothesis is never more than a supposition—that is, a conception not absolutely demonstrated; but in the first case it is regarded as corresponding with the true nature of things, in the second it is only a convenient means for the mind to conceive them. The difference would be nearly that existing between natural and artificial classifications. For instance, the hypothesis of the ether is still only a hypothesis, since that substance does not come immediately under experience; but for scientists this hypothesis, in proportion as it is warranted by the facts, veritably represents nature. Its objectivity is in proportion to its probability. Because a thing is not absolutely certain, it does not follow that it is subjective, but merely that it is only probable. It

[1] *Critique of the Judgment,* § lxxiv.

is the probable, not the subjective, that is opposed to the certain. In the second case, on the other hand, the hypothesis is only a means fashioned by the imagination to represent the phenomenon to be explained. I can employ the hypothesis of attraction without attributing to it any objective value, but simply because it is convenient for the mind. I may imagine, for instance, a straight cord attached to the moon, and which should be drawn by some one placed in the centre of the earth. Here is a figure, a metaphor, which serves to fix my ideas, as diagrams drawn on the board fix the ideas of the geometrician.

It is evident from these distinctions that a principle may not impose itself on the mind with the same necessity as the principle of causality, and yet not be, therefore, an exclusively subjective conception. An *opinion* is not necessarily a *fiction*. Even if finality and its cause in a divine intelligence should only be admitted in quality of opinions, it would not follow that they are only conventional rules for the use of the reason. The degree of their probability would have to be determined by comparison with the facts, but one would not thereby be warranted to transform them into figurative symbols having no relation to reality.

What we grant to Kant, as we have proved it in our first part, is that finality is not a constitutive principle, like the principle of causality. It is not a principle inherent in the human mind, and applicable in a necessary and universal manner, like the principle of causality itself. It is an induction, resulting from analogy. No more has it the certainty that experiment and calculation can give; it is a hypothesis, a doctrine, an opinion; it is neither a theorem, an axiom, nor a fact. On this account it may be granted that there is something subjective in this doctrine—namely, the part that is insusceptible of demonstration and verification, and also the unknown part that goes on always increasing in proportion as we approach the very source of the creative activity. But then, again, the same doctrine is objective where it repre-

sents facts; it is real on the same ground as all induction that rises from what is seen to what is not seen. Such is the induction that makes us believe in the intelligence of our fellows. No one will maintain, doubtless, that this belief is a constitutive principle of the human reason, and still it will not be concluded that it is only a regulative principle and a symbolic fiction. There is here, then, a medium that Kant has not sufficiently distinguished.

Besides, we must not forget the fundamental distinction made at the beginning of this book between the finality of nature and the first cause of that finality. It is one thing to say that nature has ends; it is another to say that the cause of this nature is a mind that has co-ordinated it according to ends. The hypothesis of subjectivity can be applied either to the first or the second of these two propositions. It may be maintained either that the ends of nature are only appearances, or that, these ends being admitted as real, it is only the hypothesis of an intelligent cause that is a mere symbol, a mere regulative maxim of the mind. But Kant has never clearly explained himself regarding this difficulty. Sometimes he distinguishes the two questions, and only applies his subjectivism to the second hypothesis; sometimes, on the other hand, he seems to involve them both in it,—in a word, what he calls subjective is sometimes finality in general, sometimes intentionality. Reserving this second question for discussion afterwards, let it suffice us to say with Trendelenburg,[1] that if finality were a purely subjective hypothesis, it

[1] The Kantian hypothesis of the subjectivity of final causes has been discussed by the learned logician Trendelenburg (*Logische Untersuchungen*, t. ii. p. 47 et seq.) with great force, and we think we ought here to sum up his argument.

1st, Kant reasons as if nothing that was subjective could be objective, and *vice versa*; he has not thought of discussing the hypothesis according to which something might be at once subjective and objective. It is not enough that a principle is not derived from experience for it not to have an objective reality.

2d, If finality is a principle only regulative, but not constitutive, it signifies nothing; this principle is no more even a rule. A rule of arithmetic or grammar is constitutive, conformable to the thing itself; otherwise what would it signify? But, it will be said, there are rules—as in grammar the rules of the genders—which unite what perhaps has no relation, in order to aid the memory.

would answer no purpose, and it would be quite as well to dispense with it.

The doctrine of the subjectivity of final causes could have no solidity if it were not attached to the general principle of subjectivism,—that is, the hypothesis that makes of all the laws of nature principles of the human mind; but it would be passing beyond our subject to enter on the question of the objective value of our knowledge. It is enough for us to

Might not the principle of final causes have as low a value? Even in this case, the rules of the genders say something on the nature of the object itself. If the principle of finality has no objective value, it is only a fortuitous association of ideas.

3d, Why does Kant admit that finality is a *principle more* which we have need of to subject the phenomena to rules, when mechanism no longer suffices to explain them? This principle *more* is a singular acquisition. A principle ought to simplify; that of finality only brings confusion, since it employs an interpretation of the phenomena absolutely contrary to the principle of the efficient cause. If this contradiction has no serious inconveniences because the principle of finality is purely subjective, then that principle has no more value than the alphabetical order followed in dictionaries, or any other artificial classification.

4th, Kant is wrong to compare the employment of the principle of finality to that of the principle of the absolute, which also is to him only regulative without being constitutive. The principle of the absolute (*das Unbedingte*) prevents us from stopping at the particular and the relative; it pushes us always forward, and excites the inactivity of the reason, but it leaves it in the same domain, in that of the efficient cause. The principle of finality, on the contrary, does not push us in the direction of the efficient cause; it leads us entirely to reverse the order of the facts. This reversal can only be called a rule so far as it leads to the truth. If finality is not in things, it only leads our mind astray and distorts reality.

5th, In fine, what is the relation of the principle of finality to the other subjective elements of Kant's philosophy? If finality were a necessary form of our knowledge, as space and time are the necessary forms of sense-intuition, all things would appear to us in the relation of means and end. But no; according to Kant, the help of finality is called in when the explanation by the efficient cause no longer suffices; it is the object itself that forces the mind to quit the road it was following. It is, then, the *object* that determines when we must apply the *purely subjective* principle of finality.—This last objection is borrowed from Herbart. 'How is it,' says the latter, 'that the convenience of the arrangements of nature is only made entirely evident in certain cases; that very often this convenience appears doubtful to us; in fine, that nature often offers us a certain mechanical regularity, or even simple facts, of which it is impossible for us to give an account? If the idea of convenience were a necessary form of the mind, it ought to admit of being applied to all things, like the form of time and space (or even the principle of the absolute)' (*Einleitung in die Philosophie*, § 132).

have proved that it is not more subjective than the others. It is true or false, certain or doubtful, probable or improbable, like all that is discussed; but in proportion as it is established and demonstrated, it is as objective as any other truth. Is it the same when, passing from finality to its cause, and from nature to God, we infer an intentional cause? We shall see this farther on.

There is yet a kind of *subjectivist finalism* which we find in one of the most distinguished of contemporary philosophers, whose name we have already several times met with in these studies, M. Lachelier. He has thought proper to found the law of final causes not on mind, but on feeling. According to him, the law of efficient causes, which, he says, 'is reducible to the connection of motions,' is essential to the mind; thought cannot deny it without destroying itself. But feeling has its exigencies as well as the mind. 'A world in which motion, without ceasing to obey its own laws, should no longer form any synthesis, or should only form discordant syntheses that would destroy each other, such a world would not, perhaps, be less conformable than ours to the exigencies of thought,[1] but it would be far from satisfying those of our feeling, for in the former case it would leave it absolutely void, and in the latter would only cause it painful modifications.'[2] However, the author acknowledges that this is a very insufficient proof; for why should nature be obliged to satisfy our faculties? Would not affirming it *à priori* be to assume precisely what is in question—namely, that nature has an end? How, then, could feeling impose on things a law not essential to them?

The way the author employs to explain his theory is as follows: It is not only the interest of sensation, but of thought itself, that requires the law of final causes. 'Because

[1] This is a very great concession. Plato, in the *Theætetus*, seems to believe the contrary. In fact, if a thing is destroyed as soon as formed, how can we think it?

[2] *Fondement de l'induction*, p. 83.

this law especially concerns feeling, it by no means follows that it is foreign to the essence of thought; and we do not abandon the proof that thought itself supposes the existence of this law.'[1] Thus after having introduced feeling, the author abandons it and speaks of it no more, and reverts from it to the necessities of thought. Since feeling goes for nothing, what need was there to speak of it? Will it be said that it is not the bare mind by itself that needs final causes, but the mind combined with feeling? This is merely saying that it finds its pleasure in it; but the preceding objection reappears as strongly: Why should things correspond to the necessities of our feeling? If it were only a question of some very rare cases of wonderful adaptation, it might be maintained that it is, in fact, a lively fancy of our mind, against which we do not attempt to strive, to consider these phenomena as the work of an artist; and the most decided anti-finalists in the theoretic order do not refuse themselves this pleasure in the joy of admiration and enthusiasm. One can see that a man might say in such cases: I don't care whether it is really so; I can only enjoy on condition that it is so; do not take away my dream—you would take away my happiness. But the author sees finality not only in such cases, but everywhere in all that is ordered, in all that presents a certain unity—that is, in the whole universe; nay, more, it is still finality, according to him, that constitutes 'the existence' and 'reality' of phenomena.[2] Then how can we conceive that our feeling could thus command the order of things? and how should the laws of motion, in order to please our mind, constrain themselves to form composite and harmonious wholes?

The author proves that the law of thought is unity. But there are two sorts of unity; the one a unity of necessity, the other a unity of convenience and harmony. But if the mechanism of the universe strictly satisfies the first of these

[1] *Fondement de l'induction*, p. 85.
[2] *Ibid.* p. 85 et seq.

two unities, it is further necessary, to satisfy the second, that the universe be an organism. Thus, regarded as pure thought, the mind imposes on phenomena the law of mechanism ; while, as mingled with feeling, it imposes on them the law of finality. We cannot comprehend this theory. We would admit it were we told : The phenomena are what they are, and we can effect no change in them; perhaps they are exclusively mechanical. But as we see in them order which we cannot explain, we are pleased to suppose a final cause. We abandon ourselves to this hypothesis, be it true or false, because it is agreeable and convenient to us. But this is not what the author means. He seems to believe that motion alone has no reason to form any regular compositions, or even any compositions at all; and we quoted from him above a beautiful passage, in which he expresses himself very strongly to this effect.[1] The laws of motion do not, then, suffice to explain the harmony of the universe; there is another principle. But, then, what now becomes of your feeling? What does it signify whether that pleases you or not? It is, because it is, and not because it is agreeable to you that it should be. It may be maintained, if you will, in an exaggerated final-causality, that God has only made the world to please us; that He has illumined the suns and the stars that we might contemplate them. But to give as a proof of final causes what is only an excessive and exclusive consequence of them, is to invert the order of ideas.

Will it be said that by feeling must be understood not human feeling, but feeling in general, and by thought not human thought, but thought in general? In this sense, it might be maintained that thought in the pure state is manifested in the universe by mechanism, and that, connected with feeling, it is manifested in it by finality. But then the question would no longer be regarding the faculty that should give us the principle of *ends*, but regarding the *cause* of the ends themselves, so far as previously granted as object of

[1] See above, Book i. chap. v. p. 172: 'The world of Epicurus before the concourse of the atoms . . .'

experience; from critical teleology one would pass without notice to dogmatic teleology. One would thus assume what is in question—namely, the objective validity of the principle of finality. In fine, is it meant that human feeling and feeling in general are but one, and that nature being only the play of our mind, identical with mind in general, we are warranted to conclude from the one to the other? If, then, it is a necessity of our thought and our feeling to conceive things as ordered, that is true of all thought and all feeling, and nature, having no objective existence apart from the mind that thinks and the feeling that enjoys it, is forced, in order to be something, to conform itself to the exigencies of both. If this be so, we only perceive in it a very complicated and entangled way of expressing what we here maintain, that finality is objective and not subjective; for it will always be permissible to distinguish the subjective mind as circumscribed within the limits of the individual consciousness or the human consciousness, and the objective mind that animates all other men apart from me, before me, after me, and that equally animates all other beings. That nature exists in virtue of the laws of this objective mind is denied by none of those who recognise finality in nature; but as it derives its laws from this objective mind, it is it that is imposed on our thought and feeling (that is, on the only thought and feeling we directly know); it is not we that impose it on nature.

In a word, it is either admitted that mechanism absolutely cannot, despite the theory of fortunate chances, produce an ordered whole,—hence, as the world in reality has hitherto always presented to us a whole of this kind, it must be acknowledged that there is effectively and objectively a principle of finality in the universe, and thought, united or not to feeling, can only recognise it, and not constitute it,—or else, on the other hand, it is maintained that it is thought joined to feeling that carries with it the principle of finality. Then how can and ought nature to agree with thought, so as

to produce for its pleasure the innumerable prodigies of adaptation of which the universe is composed? And to say that nature is ourselves, is to pass perpetually from the subjective to the objective sense, according to the need of the moment, by a perpetual succession of equivocations, in which all distinct thought is swallowed up.

§ 2. Immanent Finality.

If, on the one hand, led by the general tendencies of his critical philosophy, Kant seems to conclude for the doctrine of the subjectivity of final causes, on the other, by certain aspects of his theory, he opens the way again to a very different and more profound doctrine, which, while objectivizing the final cause, like the earlier philosophy, gives it a new form and an entirely different signification. Here it is proper to revert to a reservation made by Kant in the *Pure Reason*, and already indicated above,[1] but too important in its consequences not to be expressly mentioned.

'We will not here dispute with natural reason on this argument, in which, founding on the analogy of some productions of nature with the products of human art (our machines, vessels, watches), it concludes that nature must have as its principle a causality of the same kind. . . . Perhaps this reasoning would not bear strict examination by the transcendental criticism.'[2]

The celebrated Dr. Strauss, in his *Christian Dogmatic*, reproduces this difficulty. 'This proof,' he says, 'is founded on the analogy of certain products of nature with the works of art; the organism resembles a clock, the eye a telescope, the body of a fish a vessel, etc. But a clock, a telescope, etc., are the works of a wisdom that has adapted the means to the end; therefore the products of all nature are the work of an intelligence which is apart from it.—But first,

[1] See the previous chapter, p. 332.
[2] *Critique of Pure Reason*, 'Transc. dialect.' Book ii. chap. iii. § iii.

why should this intelligence be apart from nature? What constrains us to go out of nature? Therefore the analogy is only superficial. The pieces of a machine, of a work of human industry, remain strangers to each other; motion and unity are impressed on them from without. On the other hand, in the organism each part is in intimate, continual communication with the others; they all serve each other as end and means. There is just this difference between the works of human industry and those of nature, that the artist is outside the former, and forms the matter from without inwards; while he is within the latter, and forms the matter from within outwards. *Life is the end that realizes itself.*'[1]

The knot of the difficulty, as is evident from this objection, is in the comparison of the works of art and those of nature. While it is only a question of finality, analogy can go so far; but when it concerns the first cause of finality, analogy becomes inexact and insufficient, for this reason, that human industry supposes a pre-existing matter, which it turns from its ends to appropriate to its own, while nature works in nothing but itself, and has no need to pass beyond itself to realize its ends. In other words, the industry of man is *external*, that of nature is *internal*.

Aristotle had already noticed this difference between nature and art—nature acting from within, and art from without.[2] Kant has made the distinction deeper.

'In a watch,' he says, 'one part is an instrument that serves to move others; but no wheel is the efficient cause of the production of the others. One part exists *for the sake of* another, and not *by* the latter. Therefore, also, the productive cause of these parts and of their forms does not reside in the nature (of this matter), but apart from it, in a being capable

[1] Strauss, *Die Christliche Glaubenslehre*, 1840, t. i. p. 385. Hegel says likewise: 'No doubt there is a wonderful agreement between the functions of different organs; *but does this harmony require another being outside the organism?*' (*Lessons on the Proofs of the Existence of God*, p. 458.)

[2] Aristotle, *Phys.* lib. ii. 8 (Berlin ed., 199, b. 28): εἰ γὰρ ἐνῆν ἐν τῷ ξύλῳ ἡ ναυπηγική, ὁμοίως ἂν φύσει ἐποίει.

of acting according to the idea of a whole possible by its causality. And as in the machine one wheel does not produce another, for a stronger reason one machine does not produce others, by employing for this other matter (which it should organize). Besides, it does not replace of itself the lost parts; it does not repair the faults of the original construction by the aid of the other parts; it does not restore itself when disorder has entered it,—all which things, on the other hand, we may meet with in an organized being. An organized being is not, then, a mere machine, having only the *motive* force; it possesses in it a *formative* virtue, and communicates it to materials that have it not, by organizing them; and this formative virtue, which propagates itself, cannot be explained by the motive force alone (by mechanism).'[1]

In a word, the works of nature are distinguished from the works of art by the three following differences:—1st, The organized being has a *formative* virtue: the germ successively assimilates all the particles it borrows from the external world; 2d, It has a *reparative* virtue: when it is injured it repairs itself (in this sense it is said that nature is the best physician; it is even known that after wounds and even mutilations the different parts are often spontaneously reproduced); 3d, In fine, it has a *reproductive* virtue, for the species perpetuate themselves by the law of generation.

These differences are so visible that they have never escaped the observers of nature and the defenders of final causes. 'Let us confine ourselves,' says Fenelon, 'to the animal machine. There are three things in it that cannot be too much admired: 1st, It has in itself wherewith to defend itself against those that would attack and destroy it; 2d, It has wherewith to renew itself by food; 3d, It has wherewith to perpetuate its species by generation. What would be thought of a machine that should flee to purpose, that should recoil, defend itself, and escape in order to preserve itself, when it was sought to break it? What is more beau-

[1] *Critique of the Judgment*, § lxiv.

tiful than a machine that repairs and renews itself incessantly? What would be said of a watchmaker who could make watches spontaneously producing others without end, so that the two first watches should be sufficient to multiply and perpetuate the species on the earth?'[1]

It is evident that Fenelon mentions nearly the same characteristic differences as Kant; only, in place of seeing therein a difficulty, he makes use of them as an *à fortiori*. From these differences between nature and art he concludes not that the cause of nature is not an art, but rather that it is an art very superior to ours. According to Kant, the organization of nature has nothing analogous with any of the causalities we know, and it cannot be conceived and explained exactly by analogy with human art. Fenelon is right in saying that the art of nature is superior to human art. But are we at liberty to conclude from the one to the other? Is not nature rather an *analogue of life* than an *analogue of art?* Far from being like human intelligence, it would be the very principle from which human intelligence is itself derived, and the industry of man would only be a particular and entirely relative case of this universal art.

This distinction of Kant between nature and art attaches to another profound theory of the same thinker, which has had the greatest influence on the further development of German philosophy. I mean the theory of *internal* finality, which we have often mentioned, but to which it is necessary to revert.

According to Kant, there are two species of finality—*internal* and *external* or *relative.*

'Finality purely external—that is, the utility of one thing for another—is never more than relative,' and 'only exists accidentally in the thing to which it is attributed.'[2] In fact, this finality always supposes something else than itself, and is always hypothetical. If the sand of the sea is fittest for the

[1] Fenelon, *Traité de l'existence de Dieu,* Book i. chap. ii.
[2] *Critique of the Judgment,* § lxii.

growth of pines, this property can only be considered as an end of nature by supposing that pines themselves are ends of nature,—that is, that it has resolved beforehand that there shall be pines. In this sort of finality things are never considered but as means, but these means can only be such if there are beings that are considered immediately and in themselves as ends. But these beings are precisely those that show an *internal finality.* The first, then, are only ends relatively to the second, and the latter alone can afford room for an *absolute teleological judgment.*

This profound distinction of Kant has some analogy with that which he sets up in his ethics between *subjective* and *objective* ends, whence arise two sorts of imperatives — the *hypothetical* and the *categorical.* Subjective ends are those that are always subordinated to other ends, and which consequently are only means, and only afford room for conditional rules: *If* you wish to be rich, be economical. *Objective* ends are absolute, and afford room for absolute precepts: Be sincere, whether it please you or not. So here external finality is hypothetical. Reindeer in northern lands are food destined for man, *if* it be supposed that there must be men in those countries. But why should that be necessary? On the other hand, in order that an object of nature may be considered immediately as an end, and afford room for an absolute teleological judgment, we must, without leaving that object, and without needing to subordinate it to another, remark in it that 'the possibility of the form could not be derived from the simple laws of nature,' that 'this form is contingent on the eyes of reason,' and 'does not seem possible but by it'—in a word, that it is such that 'the whole contains *the possibility of the parts.*'[1]

Such, in the first place, is the character common to every end, the works of art as well as those of nature. But for a work of nature something more is necessary—namely, 'that it be at once its own *cause* and *effect;*'[2] that is, as we have

[1] *Critique of the Judgment,* § lxiii. [2] *Ibid.*

seen, that it be able to organize, repair, and reproduce itself. 'The leaves of the tree are the products of the tree, but they also, in their turn, preserve it.' Consequently, an end of nature is a production in which 'all the parts are *reciprocally ends and means*.'[1] Such is the character of internal finality.

We see here one of the sources of all the later German philosophy. The internal finality of this philosopher became the immanent finality of the Hegelian school.[2] Instead of conceiving a supreme cause, *supra-mundane*, constructing works of art, as man makes houses and tools (which would seem to suppose a pre-existing matter), the entire German pantheism has conceived an intra-mundane cause, realizing its end in itself. The physical theology of the 18th century, according to the Hegelians, was exclusively founded on external finality,—that is, on utility,—and conceived all the objects of nature as fabricated for an external end. The idea that was formed of nature did not much differ from that of the Epicureans—namely, that therein all was mechanical, and that there was nothing internal in the universe. In place of chance, an external motive cause was brought in, a *deus ex machinâ*. But this cause only produced inert works, none of which was in itself a source of action, and whose only end was to serve for something else than themselves. However, Leibnitz had already, by his notion of force, restored the principle of an internal activity of things; the internal finality of Kant completed the same idea. But then, if things are no longer inert blocks, moved from without, but all living, animated within, the world itself ought no longer to be conceived as an inert and dead mass, but as a veritable whole, as an organism.

Hegel's doctrine on final causes may be reduced to these three fundamental points :—

[1] *Critique of the Judgment*, § lxv.

[2] 'Kant,' says Hegel, 'in bringing to light *the internal conformity of things to their end*, has called attention to *the intimate nature of the idea*, and, above all, to the idea of life' (*Logic*, § 204).

1st, There are final causes in nature, and even all is final cause. The domain of efficient causes is that of blind necessity. The final cause is the sole veritable cause, for it alone has in itself the reason of its determinations.[1]

2d, It is not necessary to conceive the final cause in the form that it has in consciousness,—that is, as an anticipated representation of the end. The ends that are in nature are not like the ends we realize, which are the result of choice, foresight, and voluntary activity. There are two ways of attaining an end,—the one, of which we find an example in human industry; the other, which is rational, without being conscious and reflective, and which is the activity of nature.[2]

3d, The finality of nature is an immanent, internal finality. It is not, as in the works of human industry, an external cause that produces certain means to attain an end that is foreign to them,—the cause, the means, and the end constituting three terms separated from each other. In nature all is united in the same principle—the end realizes itself. The cause attains its end by self-development. The image of this development is in the seed that contains the whole being that it has to realize. It attains its end without going outside itself. It may be said of entire nature what Kant said of the organized being, that in it everything is reciprocally

[1] 'The distinction between the final and the efficient cause is of the utmost importance. The efficient cause belongs to the sphere of blind necessity, and of what is not yet developed; *it appears as passing to a foreign terminus*, and as losing, in being realized, its primitive nature. The efficient cause is only a cause virtually and for us. *The final cause, on the other hand, is stated as containing in itself its determination*, or its effect, which, in the efficient cause, appears as a foreign term ; wherefore, in acting, the final cause does not go beyond itself, but develops within itself, and is at the end what it was at the beginning, and in its primitive state. This is the true first cause' (Hegel, *Logic*, Fr. tr. t. ii. p. 321). 'Because the mechanical world and finality both are, it does not follow that they both have the same reality ; and as they are opposed, the first question is, Which of the two contains the truth? But as they both are, a more precise and higher question is, whether there be not a third principle that forms the truth of both, or else whether one of them does not form the truth of the other. But finality has been here set forth as the truth of mechanism and chemistry' (*Ibid.* ii. p. 334). See also the remarkable passage quoted above, p. 182.

[2] On this second point see the following chapter.

end and means. Internal finality thus becomes immanent finality.[1]

We have no difficulty in admitting, for our part, that internal finality is likewise immanent finality, but on condition that the second term shall have exactly the same sense as the first, and shall add nothing more to it; but from this immanent finality to infer an immanent cause of finality, is to put into the conclusion what is not in the premises, for it is saying that every cause that pursues ends spontaneously and internally is, therefore, a first cause.

Let us remark, besides, that the opposition of *transcendence* and *immanence* is very far from being so absolute in reality as it appears in the eyes of the German philosophers. There is no doctrine of transcendence but implies at the same time some presence of God in the world, and, consequently, some immanence. There is no doctrine of immanence but implies some distinction between God and the world, and, consequently, some transcendence. Absolute transcendence would be such a separation of God and the world that they would no longer have anything in common—that God could not know the world, nor the world know God. Absolute immanence would be such an identity of God and the world that the cause would be but one with the effect, the substance with its phenomena, the absolute with the relative. But there is no example in philosophy of either the one or the other of these conceptions. Even in the Scholastic theism, or in that of Descartes and Leibnitz, whoever will fathom the theory of the *divinus concursus*, or of the *continued creation*, will see profound traces of the doctrine of immanence. Conversely, in the pantheism of Spinoza or Hegel, whoever will reflect on the distinction of *Natura naturans* and *Natura*

[1] 'Finality is not external to nature, it is *immanent* in it. The seed virtually contains all the constituent parts of the plant that have to be produced, and its development is only directed towards preservation. True teleology consists in considering nature as independent in its proper quality . . . ' (*Philosophy of Nature*, § 245).

naturata, of the *Idea* and *Nature*, will clearly recognise a doctrine of transcendence.

Thus when it is asked, as by the Hegelians, whether the supreme cause is within or outside nature, the question is badly stated, for in every solution the cause will always be at once within and outside nature. It is a question of degree. But it is true that the physico-theological proof by itself does not furnish sufficient data to fix with precision the degree of distinction between the cause of nature and nature itself. If, for instance, it is required to proceed to a *substantial distinction*, whoever comprehends the terms of a philosophical question will allow that such a distinction is not contained in the premises of the argument of final causes; but no more is it necessary to demand it, for it is not that that is in question. No one pretends to resolve with a single argument all the difficulties of philosophy, and, conversely, one ought not to require it. The problem of transcendence in the strict sense of the word—that is to say, the conflict between theism and pantheism—cannot be decided by the proof of final causes.[1] A God the soul of the world, as was the God of the Stoics, is, indeed, in no way excluded by the proof of final causes; but, even on this hypothesis, God would still be distinct from the world, as the cause from its effect, and this distinction suffices here.

Even in the philosophy of Hegel there is a profound difference between things and their cause or reason. If we consider an individual organized being, Hegel will not say that the cause of this being is in the individual itself as such. Certainly not; it is in the idea of the species. This idea, so far as it is absolute and immanent, is very distinct from the individual that manifests it, for the latter passes away while it remains. What is true of the individual is true of the species. No species is its own cause, nor suffices for itself. The cause of humanity as a species ought to be

[1] The true point of debate between theism and pantheism is the explanation of consciousness and the ego.

sought in the universal type that constitutes the animal kingdom, and the cause of the animal, as well as of the vegetable kingdom, ought to be sought in the idea of life in general. In fine, vitality in its turn is still only a form of the universal principle which manifests itself first by mechanism, then by chemistry, then by organism, and finally by mind. We shall thus distinguish, even in the philosophy of Hegel, the particular beings given by experience from the internal causes that produce them; we shall distinguish *nature* and *idea.* Since nature is externalized idea,[1] it clearly follows that the one of these terms is not the other. For it may always be asked, Why did not the idea remain quiet? Why did it come out from itself? It is clear that that is a new mode of existence for it, and, consequently, even in the philosophy of Hegel, the supreme cause is apart from nature. It is at once apart and within; and all profound theology has always taught this.

Is it true, meanwhile, that the theory of internal finality, such as Kant constituted it, excludes all transcendence in the first cause, and absolutely contradicts what Hegel calls *finite theology*,[2]

[1] 'The absolute liberty of the idea consists in this, that it resolves to *produce itself outside* as nature' (*Philosophy of Nature*, § 244). 'The absolute liberty of the idea consists in this, that it decides to derive freely from itself the moment of its particular existence, *to separate from itself*,—in a word, *to place itself* as nature' (*Logic*, § cliv.).

'If God is self-sufficient, how comes He to produce something absolutely dissimilar? The divine idea just consists in producing itself outside, *in sending forth the other* from itself, and in then resuming it, in order to be subjectivity and mind' (*Phil. of Nature*, § 247).

'Nature being *the idea under the form of the other*, it is not only external in relation to the idea and to the subjective existence of the idea under form of mind, it is, besides, *external to itself; externality constitutes its essential character, its nature*' (*Ibid.*).

[2] This term, *finite theology*, is one of those cleverly-chosen expressions by which a philosophical school finds means to throw back on an adverse school the suspicion and reproach by which it is itself threatened. If there is a finite theology, it would seem to be that which identifies God with the world, and that confounds the Absolute Mind with human philosophy. On the other hand, a doctrine which, wrongly or rightly, conceives a complete and perfect Absolute apart from the world, and only sees in the world an image, reflection, a feeble expression of God, is as badly as possible represented by the expression finite theology.

—that is to say, theism? and, conversely, is theism condemned, as he maintains, and limited to *external* finality?

These are very arbitrary views, forced consequences, drawn from premises that do not contain them. External finality is a relative and subordinate finality, but it is inseparably connected with internal finality, as has been seen above;[1] it is the converse of it. Hegel himself regards it as we do; for he owns that finite theology rests on a just idea, which is, 'that nature has not its end in itself.'[2] But the theist says no more. Finite theology is by no means bound to affirm that all has been created since the beginning of the world for the use of man. Descartes and Leibnitz long ago repudiated that doctrine. But transcendental theology, as well as immanent, is entitled to say that the different degrees of nature are steps of a ladder that the divine thought successively mounts in order to realize itself, and that the lower are steps to the higher. As far as Aristotle and Hegel admit that final causes have need of efficient, to the same extent finite theology will admit that efficient causes are made for final causes. As to the more or less popular forms which may have been employed to express this doctrine, it is hardly philosophical to make use of them against the doctrine itself, for it is in its highest expression, and not in its most superficial meaning, that it must be taken.[3]

[1] See above, Book i. chap. v. p. 157, and chap. vi. p. 196.

[2] 'Man,' he says, 'considers himself, and with good reason, as an *end* in regard to natural agents. The consideration of nature, in this point of view, is that of finite theology. This theology rests on a just idea, that nature does not contain in itself the absolute end—the last end' (*Encyclopædia of Philosophic Sciences*, *Philosophy of Nature*, § 245).

[3] It is not even true historically that the physical theology of the 18th century is exclusively dominated by the utilitarian point of view, or that of external finality. Paley's book, for instance, hardly appeals to this point of view, and rests mainly on the internal finality of organized beings. The existence of a supreme cause of nature is deduced quite as well, and even much better, from internal finality than from external utility, or from pure mechanism. For a cause powerful enough to make a work having in itself the principle and end of its action, is superior to that which would be obliged incessantly to put its hand to the work. The same is true of the frivolities with which Hegel, after Voltaire, and with less wit than he, reproaches the final-causalists, but which no more belong to the doctrine of transcendence than to that of immanence.

If internal finality is impossible without external, conversely external finality is only a relative point of view, which, taken higher, may return to internal finality. In effect, instead of considering each organism by itself, let us consider them all in their totality. We shall see that they are all reciprocally means and ends, like the internal parts of an organism. It is thus, for instance, that the vegetables serve the animals and the animals the vegetables, whether in taking from or in restoring to the air the elements that are useful to them respectively,—these oxygen, those carbon; or, again, in serving as nutriment for each other,—on the one hand as food, on the other as manure. It is also evident that all living beings nourish each other, in so far as the superior animals, and even man, afford food to the infinitely small ones, whose function seems to be to preserve life in the universe by destroying putrefied matter, which would poison the air and deprive it of every vital property. In fine, living beings in general are in a perpetual commerce with matter in general; and the circulation of the elements constitutes in some sort an internal life of the earth, analogous to that of the individual organism. Such analogies cannot be rejected by Hegel, for no philosopher has pushed them farther.

Thus we have here a sort of internal finality; but it is not absolute, since things are not founded in a unique being, and all 'natural beings are external to each other, exist outside and independently of each other.'[1] Hence it follows that, in considering them separately, they seem only to be means, and this is what is called external finality. It will, therefore, be allowable, if they are taken thus, and not in their totality, to give prominence to their external utility—a point of view that does not exclude the other, and is closely united to it.

If, on the one hand, the transcendental theology is no way bound to the idea of an external finality, and especially to the abuse that may be made of that finality, on the other hand it

[1] *Philosophy of Nature*, § 249.

is no way contradicted by the idea of an internal finality, such as Kant explained it. That a supra-mundane cause has produced a work manifesting an internal finality, and even realizing that finality by its own powers, presents nothing contradictory; for there is still a distinction to be made here, and every *internal finality* is not accompanied by an *internal motor*, nor conversely. In a statue, for instance, the finality is internal, for a statue is not like a machine, an instrument for making something: it is its own end, and yet it does not realize itself; the motive cause is outside of it. A transcendent cause may therefore produce a work that has an internal end. Conversely, a workman who employs his arms to move a wheel is the internal and immanent cause of the motion of his arms, and yet the end is external; for the arms do not work for themselves, nor for the rest of the body, but for an external machine: they are machines of machines. In fine, one may conceive a transcendent cause that should produce a work animated by an internal principle, and acting for an internal end. Thus the father is in relation to his son what the Scholastics called a *transitive* cause; and yet the son has an internal principle of action, and that principle moves according to an internal finality. According to this, one does not see why the supreme cause of nature should not have produced works (no doubt derived from it), but not purely mechanical, and having in themselves the cause and end of their evolution.

The doctrine of a supra-mundane cause not only does not exclude the idea of an internal principle of action in nature, but it may almost be said to require it; and it may be maintained very forcibly, with Leibnitz, that it is only on this condition that pantheism—that is, absolute immanence—will be overcome. For it is not for maintaining a certain degree of immanence that a philosophy can be characterised as pantheism; at that rate there would be none that had not that character. But the proper character of pantheism (if it knows what it means) is to refuse to finite beings all proper

activity, in order to restore it to the absolute cause and substance. If, then, this absolute cause or substance is believed to be distinct from the world, supra-mundane, transcendental, that can only be by attributing to the finite a proper reality, and that proper reality can only be an internal activity or an internal finality, or both together. If, on the other hand, the doctrine of absolute immanence be maintained, it must be recognised that the finite, considered as such, has nothing that is internal and proper to it. Hence nature, as phenomenon,—that is, perceptible nature, that which alone we know by experience,—will only be composed of appearances and shadows, having in themselves neither their principle of action nor their end, and having no more title than the artificial works of man to a *soi-disant* internal activity.

Another objection of the Hegelians[1] is that in the hypothesis of finite theology, or of transcendency, things form an indefinite series of means and ends, of which the limit is not to be seen. The true final cause, on the other hand, ought to form a circle, and, being the realization of itself, to return to itself,—that is, to be found at the end what it is at the beginning. Be it, for instance, the immanent principle of nature that the Hegelians call the *idea*, this principle, issuing from itself, will become physical nature, dead nature. It at first shows itself as foreign as possible to itself in *mechanism* or pure motion; then, in *chemistry*, it begins to make a certain effort to return to itself, to arrive at an end; but it is an impotent effort. This chemical labour, perpetuated and becoming durable, is the *organism*. Here the return movement is still more visible; the effort to attain unity is more efficacious; there is not merely combination, but concentration. Finally, above the organism rises the mind, in which the return of nature to the idea is completely manifested, first in the individual or *subjective* consciousness; then in the consciousness of peoples and races, the *objective*; and, finally, in

[1] Kuno Fischer, *Logik und Metaphysik*, 2 Auflage, Heidelberg, 1865, p. 502 et seq.

the *absolute* consciousness—that is to say, in art, religion, and philosophy. At this last terminus the idea has realized itself, it has found itself again after having lost itself. It believed itself distinct from itself, and it was still itself; and it is still it that arrives at self-consciousness in philosophy.[1] Here, then, is a true end—the world forms a circle; while in the other theology there is no end, and the world incessantly seeks one, but does not attain it. Such would be the advantage of the doctrine of immanence over that of transcendence.

It is, in our opinion, a pure illusion. I own that, in the conception of a world distinct from God, each being, always being imperfect, cannot be considered as an absolute end; man himself is not the absolute end of nature. If we suppose above man other creatures superior to him, we no more conceive that any of them could be an absolute end. The world is thus an indefinite line of which we cannot see the limit. But is it otherwise in the doctrine of immanence? In the one as in the other one does not see a terminus; and as to saying that, in the latter, the development of the world is represented under the figure of a curved line, and, in the former, of a straight line (except that these are geometrical metaphors of mediocre clearness), there is no reason to make such a distinction; for, on the hypothesis of transcendence, God being at once the end and the cause of creation, the latter tends to return to Him after having removed from Him, exactly in the same way as in the opposite doctrine. Yet once more, the curve will never be finished; but it will no more be so according to Hegel than to Leibnitz. The finite will never arrive at an adequate consciousness of the absolute, the mind will never realize the idea in its totality, which would be necessary to complete the circle. In fact, so long as the idea has not

[1] 'In itself nature is a living whole. . . . The tendency of its movement is that the *idea place* itself as what it is in itself, or what comes to the same thing, that the idea issue from that externality, which is *death*, to reduplicate on itself, and become first organism and then mind (*Geist*), which is *the last end of nature, and the absolute reality of the idea*' (*Philosophy of Nature*, § 251).

an absolute consciousness equal to itself, a perfect representation of itself, so long as the divine knowledge is not equal to the divine being, the intelligence to the intelligible, the circle will not be completed. There will always be an immense abyss between the last degree and the absolute. Thus, on both hypotheses, there is an incessant labour of nature to attain an end it will never reach; but this impossibility is much more irrational on the hypothesis of immanence than on that of transcendence. That a relative world, distinct from God, never attains the absolute, one can comprehend. But that an absolute world can never return to the principle from which it emanates is contradictory. But who can have seriously maintained, except in a first moment of intoxication now passed, that philosophy, and in particular the philosophy of Hegel, is adequate to the absolute itself? Cannot another philosophy be conceived superior to it, and another higher still, *ad infinitum?* So long as it is only a question of a human philosophy, there can be no question of a philosophy without error, obscurity, and ignorance. What! you are the absolute; and to know the cause of the smallest phenomenon, you are obliged to wait till a scientist has made experiment—has weighed, measured, calculated! An absolute that incessantly seeks and never finds itself is nothing else than a relative. Hence it must either be acknowledged that there is no absolute, that the *idea* is a pure chimera, that only nature is, and is self-sufficient, which is the negation of Hegelian idealism; or it must be maintained that the idea, while manifesting itself in nature, is yet entirely itself only in itself, and before being externalized, which is the essence of the doctrine of transcendence.

To sum up: the idea of a nature, endued with internal activity, and working to an internal, although relative and subordinate, finality,—this idea, which is nothing else than the thought of Leibnitz well understood, contains nothing that excludes a supra-mundane cause. This cause is distinguished from nature in that it is beforehand, entirely and

in itself an absolute; while nature can only express and manifest this absolute through time and space, without ever completely realizing it. It is this very impotence of nature that should force us to conclude that it is not itself the absolute, for an absolute that incessantly seeks without finding itself is a contradictory notion. If, then, something of this kind be admitted, it ought, if we know what we mean, to be distinguished from nature, at least so far that nature may develop and move without the first principle being involved in its movement. But this is precisely what we call *transcendentalism* well understood.

But if it were sought to press still farther the terms of the distinction, and to derive from them either a distinction of substances, or the creation *ex nihilo*, or some other more explicitly dualistic doctrine, we would say yet once more that this is to pass beyond the sphere of our subject, that nothing obliges us to consider these problems, and that finality does not contain in this point of view any particular element of solution.

In concluding this chapter, we shall recapitulate by saying—1st, That finality, not being a subjective view of our mind, but a real law of nature, demands a real cause; 2d, That the finality of nature is indeed, as Kant has said, an *internal* finality, and in that sense *immanent*, this second term signifying nothing more than the first. But this *relative immanence* of natural finality does not imply an *absolute immanence*, and, on the contrary, can only be comprehended by its relation to a transcendent terminus.

These two difficulties overcome, we are now face to face with the true problem: Is the supreme cause of finality an intelligent cause, a *mind?* This will be the object of our last inquiries.

CHAPTER III.

INSTINCTIVE AND INTENTIONAL FINALITY.

'ONE ought not to conceive the end,' says Hegel, 'under the form it assumes in consciousness,--that is to say, under the form of a representation.'[1] According to this principle, the end is not an effect realized according to a preconceived idea: it is the internal conformity of things to their idea or essence. Finality is thus not merely immanent, it is *unconscious.*

We find a striking instance of unconscious finality in the instinct of animals.

'The obscurity in which instinct is enveloped,' says Hegel, 'and the difficulty of laying hold of it, arise entirely from this, that the end can only be understood as an internal notion (*innere Begriff*), whence it follows that all explanations and relations that are only founded on the understanding are inadequate to instinct. What chiefly causes the difficulty is that the relation of finality is usually conceived as an external relation, and that it is thought that finality only exists where there is consciousness. But instinct is the activity that acts without consciousness in order to an end (*die auf bewusstlose Weise wirkende Zweckthätigkeit*). The animal does not know its ends as ends; but this activity that unconsciously acts in pursuit of ends is what Aristotle calls φύσις.'[2]

'This artistic instinct,' says he elsewhere,[3] 'appears as an intentional and wise act of nature (*als zweckmässiges Thun, als Weisheit der Natur*), and it has always been regarded as a surprising faculty, because it has been the habit only to see reason in an external finality. Plastic instinct is, in fact,

[1] *Logic*, § 104. [2] *Philosophy of Nature*, § 360. [3] *Ibid.* § 366.

analogous to the conscious mind; but one should not therefore conceive the final activity of nature as a mind that is self-conscious. As artistic instinct, the notion is only the internal virtuality of the animal (*das Innere an sich*, the internal in itself), an unconscious worker. It is only in thought, in the human artist, that the notion exists for itself.'

Thus, according to Hegel, instinct presents us with the type of an unconscious finality, and shows us the possibility of it; and this is the true notion of nature. Consciousness is only one of the forms of finality; it is not its adequate and absolute form. It need not be supposed, however, that, in Hegel's view, instinct itself should be the last word in finality. Before all, in his thought, finality is *notion*, *concept*, or at least an element of the notion, and instinct is only a form of it. It is only in the Hegelian Left that finality has been more and more confounded with the blind activity of nature.

But the school that has most decidedly adopted and defended the doctrine of instinctive finality is that of Schopenhauer. This school has insisted much on the principle of finality; but, like the Hegelian school, it asserts an unconscious finality, and finds in instinct the type of it.

'There is no contradiction whatever,' says Frauenstadt, 'in admitting that a force, a plastic instinct, by a blind tendency creates works which then are revealed to the analytic understanding as conformed to an end. An unconscious *finality* is not, then, a contradiction *in adjecto*; and from the denial of a personal creator of the world, aiming at conscious ends, there no more follows [illegible] of the harmony of the world than the denial of [illegible] of the organs follows from the affirmation th[illegible]ic virtue acts unconsciously in plants and [illegible] Aristotelian opposition between the efficient a[illegible] is in no way identical with the opposition [illegible]scious and the intelligent cause. [illegible] be unconscious.'[1]

[1] [illegible]sche *Philosophie* (Leipzig, 1854)

Schopenhauer expresses himself in the same way: 'The admiration and astonishment which are wont to seize us in view of the infinite finality manifested in the construction of the organized being, rests at bottom on the natural but false supposition that this agreement of the parts with each other and with the whole of the organism, as well as with its external ends, is realized by the same principle that enables us to conceive and judge it, and, consequently, by means of *representation;* that, in a word, as it exists *for* the understanding, so it only exists *by* the understanding. No doubt, we can realize nothing regular or conformed to an end, except under the condition of the conception of that end; but we are not warranted to transfer these conditions to nature, which is itself a *prius* of all intellect, and whose action is absolutely distinct from ours. It brings to pass what appears to us so wonderfully teleological, without reflection and without concept of the end, for it is without representation, a phenomenon of secondary origin.'[1]

'It seems,' says the same author again,[2] 'that nature has meant to give us a brilliant comment of its productive activity in the artistic instinct of the animals; for these show us most evidently that beings may work to an end with the greatest surety and precision, without knowing it, and without having the least conception of it. . . . The artistic instincts of insects throw much light on the action of the will without knowledge, which is manifested in the internal springs of the organism and in its formation. . . . The insects will the end, in general, without knowing it, precisely like nature when it acts according to final causes. They have not even the choice of means in general; it is only the detail that in particular cases is left to their knowledge.'

Such are the reasons of the adherents of unconscious finality. But this doctrine, we have said, may assume two forms: finality may be considered as an *instinct,* which is the doctrine of Schopenhauer, or as an *idea,* which is the

[1] *Die Welt als Wille,* t. ii. chap. xxvi. [2] *Ibid.*

doctrine of Hegel. Let us first consider the former. The latter will be the subject of the following chapter.

To attribute to nature an *instinctive* activity, is to say that nature acts like bees and the ant, in place of acting like man; it is *zoomorphism* substituted for *anthropomorphism*. We see no advantage in it.

In fact, the true difficulty, the profound difficulty in this question, is that we can only explain the creative activity of nature by comparing it to something that is in nature itself,—that is to say, which is precisely one of the effects of that activity. Kant expresses this in these words: 'Can the internal possibility of nature, acting spontaneously (*which first renders possible all art*, and perhaps even reason), be derived *from another art* still, but superhuman?' This, the true, the only difficulty, evidently applies to the hypothesis of a primitive instinct quite as well as to that of a primitive intelligence. Instinct is not less a fact of nature than intelligence itself; and in the one case, as in the other, the effect will be transformed into the cause.

But if one is content to say, like Schopenhauer, that instinct is only a *commentary* of the creative activity,—that is to say, a symbol, an example that may give some idea of it,—it may be asked wherein this commentary is more luminous than that which we find in intelligence, or in mechanism properly so called. There are, in fact, three modes of action in nature,—mechanism, instinct, and thought. Of these three modes, two only are distinctly known to us, mechanism and intelligence. Instinct is the most obscure, most unexplained. Why, of the three modes of action of nature, should the most luminous commentary of the creative activity be precisely that of which nothing is understood? All science since Descartes tends to suppress occult qualities. Instinct is essentially an occult quality. To choose it to explain finality, when it is itself the most incomprehensible instance of finality, is not this to explain *obscurum per obscurius?* In fine, of three modes of action of nature, one inferior, another superior, the other

intermediate, why choose as type precisely that which is only a middle term ?] Mechanism is inferior, but it has the advantage of being the simplest of all. Intelligence is the most complicated, but it has the advantage of being the most elevated term. Instinct presents neither the one nor the other of these advantages. A middle phenomenon, it seems, indeed, to be only a passage from the one to the other, from mechanism to intelligence—to be only a more particular and complex case of the first, or the rudimentary state of the last. In any case, it seems in no way to have the character of a principle.

In another point of view, instinct is again subject to the same difficulties as intelligence. That is to say, the latter is objected to as only known to us under the condition of organization. Are we warranted, it is said, to suppress this condition, and to conceive in the pure state, and as anterior to nature, a faculty which is only given to us as a result ? Whatever be the weight of this objection, it is as applicable to instinct as to intelligence ; for instinct, like intelligence, is bound to organization: there is no more instinct than intelligence in inorganic beings.

But if the hypothesis of instinctive finality presents no advantage over that of intelligent finality, it presents, on the other hand, much greater difficulties. The question still remains, how a cause attains an end by appropriate means, without having either known that end or chosen the means ? The question must be well answered. Is the idea of end admitted or not ? If admitted, this idea necessarily implies, whether we will or not, that, a given result being predetermined (for instance, seeing or hearing), the efficient cause, which, as such, was capable of taking millions of different directions, has limited the choice of these directions to those that could bring about the required result. But to say that a hidden cause produces this limitation and determination we know not why, is simply to revert to the hypothesis of chance.

Will it be said that only one of these directions was pos-

sible, and that all the others are excluded by the very nature of the cause? In this case the final cause is set aside in order to revert to the efficient cause, which is Spinozism. What, in fact, does the idea of end do here, and wherein is it end, if each of the effects is contained in that which precedes, and if all together are only the unfolding of the nature of each being? On this hypothesis, there is no more final cause in physiology than in geometry.

To say, with Schopenhauer, 'Because finality exists *for* intelligence, it does not follow that it exists *by* intelligence,' is at bottom to suppress finality. We must choose between *subjective* and *instinctive* finality. If finality only exists for intelligence, it does not in reality exist at all; it is an illusory phenomenon. 'It is our understanding,' says Schopenhauer, 'that, seizing the object by means of its own forms, time, space, causality, first produces the plurality and divisibility of parts and of their functions, and then falls into amazement at the perfect harmony and co-operation of these parts resulting from the original unity, in which, consequently, it admires its own work.'[1] If this be so, finality is only a subjective conception. But then the objection of Herbart, quoted above,[2] recurs: If we carry with us the concept of finality, why not apply it everywhere, and to all things, like causality? If we only do so in regard to certain objects, it is because these objects present certain special characters. These characters do not come from us; they must, therefore, have an objective cause. But instinct is not a cause—it is a non-cause; for, between the indetermination of the instinctive faculty and the strict determination of the end, there is the disproportion of the infinite to the finite.

For the rest, the inadequacy of Schopenhauer's theory is confirmed even by the acknowledgment and reform of his disciple and successor Hartmann, who, without himself advancing to the conception of intelligent finality, yet makes a way of return towards that conception. In fact, Schopen-

[1] *Die Welt als Wille*, chap. xxvi. [2] See p. 354.

hauer had completely separated the *will* and *representation* (*der Wille und die Vorstellung*). Representation, which is the foundation of the intellectual act, was, in his view, a merely secondary thing (*ganz secundären Ursprungs*). Hartmann, on the other hand, restores the bond between these two things, and says very justly: 'Tendency is only the *empty form of the will*, . . . and as every empty form is only an abstraction, volition is existential or actual only in its relation to the representation of a present or future state. No one can really will purely and simply, without willing this or that. A will that does not will something is nothing. It is only by the determination of its content that the will acquires the possibility of existence, and this *content is representation*. Thus, then, there is no will without representation, as Aristotle had said before: *ὀρεκτικὸν δὲ οὐκ ἄνευ φαντασίας* (*De An.* iii. 30).'[1]

Herein lies, Hartmann adds, the cause of the error and 'insufficiency (*die Halbheit*) of Schopenhauer's philosophy, who only recognised the will as a metaphysical principle, and made representation or the intellect originate materially.'

Hartmann admits, then, that the will is impossible without representation, only with him this representation is at first unconscious. Finality would thus still remain unconscious. And yet a great step would be taken. There would be conceded to the first cause the *reality* of intelligence, save in considering consciousness as only an accessory phenomenon, which remains for discussion. The question would no longer be as to an intelligent cause, but as to an unconscious intelligence, which is different. The question changes ground. Can there be representations without consciousness? Such is now the point of the debate. Hartmann quotes the opinion of Kant and Leibnitz; but these two authors rather speak of obscure, indistinct perceptions, of an extremely feeble consciousness, than of absolutely unconscious perceptions in strict terms. It is not for us further to engage in these questions,

[1] *Philos. des Unbewussten*, A. iv.

which would remove us too far from the present discussion. In fact, to reintroduce representation, even unconscious, into activity, is partly to return to the Hegelian conception, which reduces finality to notion, concept, idea, and not merely to pure instinct. But this point of view will occupy us in the following chapter.

This last transformation of *hylozoism* (for Schopenhauer's philosophy hardly deserves any other name) suffices to show the nullity of the explanation of finality by instinct. But if instinctive finality seems to us inadmissible, we still admit that *intentional finality* has its difficulties, which must be examined more closely.

The profoundest discussion that we know against intentionalism is that of a Hegelian philosopher, Fortlage, in his *History of the Proofs of the Existence of God.*[1]

This discussion sums up and completes all the difficulties previously enumerated. We reproduce it here.

'I. According to the argument of Paley, wherever there is finality, there must be present and in action the conception of an end to be attained, and, consequently, an intelligence in which this concept resides. If, then, a single case can be produced where an end is attained without the concept of an end necessarily intervening, the argument is invalidated. Consequently, to maintain this argument, I am forced, wherever nature by a blind impulse, or by a secret force of preservation, attains its end of itself, I am forced, I say, to recur without necessity to the creator. For instance, if the end (*Zweck*) of self-preservation is manifested in the animal, and attains its object (*Ziel*) by the taking of food, if the end (*Zweck*) of hardness is manifested in the stone, as the force of cohesion of its atoms, and attains its goal (*Ziel*) by their reciprocal attraction, I can no longer see the end in the natural forces themselves (for instance, in cohesion hardness, in hunger the instinct of

[1] *Darstellung und Kritik der Beweise fürs Daseyn Gottes*, Heidelberg, 1840, p. 237 et seq.—*Bedenken gegen die Paleysche Schlussform:* Difficulties regarding Paley's argument.

preservation), but I must violently separate the one from the other.

'We soon see ourselves drawn to other still more extreme consequences. In the artistic activity of the human race, for instance, ends are manifested that are attained by a feeling acting blindly, and not by a calculation of the mind. How often has criticism been able to discover in a man of genius, ends attained by his action of which he did not think! Could any calculation of the understanding have presented to the mind of Mozart, for depicting certain emotions of the mind, so appropriate means as those which his genius found under the influence of inspiration? But if Paley's proof is considered valid, we cannot admit any case where a determinate end is attained by determinate means, without the conception of the end being found as such in a certain understanding, and without the means having been chosen for the end by an intentional arrangement. We must thus believe that, while Mozart composed, the divine understanding assisted him like an arithmetic master, and that for the end of expressing passion he threw into his heart, in proportion as he had need, the means, carefully chosen and appropriate. If, on the other hand, it is granted us for a moment that Mozart may have attained a single end in his music by an instinct of feeling, without mental calculation, the received argument is invalidated; it may still serve to persuade, but not to convince.

'II. Mathematics give us a great number of instances of finality attained without any end proposed beforehand, or, to speak more exactly, of finality, which we do not habitually consider as such, because the end attained does not appear more important than the means applied. Kant speaks of this mathematical teleology in the *Critique of the Judgement*.[1]

'Whence comes it that, in this case, we are not astonished, as in other cases, at intentional arrangements? Why do we not infer a wise author who had ordained all that conformably

[1] *Critique of the Judgment*, t. ii. § lxi.

to the end by the most simple means? Simply because here we do not attach any value to the end attained. Whether the triangle always has the sum of its angles equal to two right angles, whether the peripheric angles subtended by the same chord are equal or not, is of no importance in our eyes, because we do not see the use of it. We do not value a wisdom even acting for an end, if that end is of no use to us. That the triangle has its three angles equal to two right angles does not appear to us an end, but an inevitable consequence of the rencounter of primitive mathematical relations. If, on the other hand, the question is of something that has reference to the preservation of man, or of some being affecting him, it seems we cannot then too much appreciate the ingenious means created and brought into play, with intelligence and zeal, for such an end, although in this case, as in that of the triangle, it might quite as well be supposed that the end is only the inevitable result of the conflict of certain given primitive relations. If the preservation of man, of the animals or plants, were bound up with the persistence of 180 degrees in the triangle, then we would wonder at the high excellence of this adaptation to the end, which we now find quite simple and natural; and if, conversely, we had no more interest in the preservation of man, the animal and the plant, than in the persistence of 180 degrees in the triangle, then, like entirely disinterested spectators, we would lose sight of the co-ordination of ends and means, and would at once ask whether all these ends, attained by nature, are not the consequences of the conflict of certain primitive laws, as is the case with ends in mathematics.

'III. Besides, it must be remembered that the teleological argument does not derive its decisive force from the existence of a universal finality, extending everywhere, but from a sort of dissemination of final causes, accidentally dispersed over the vast empire of nature, such that the striking examples shine as exceptions so brilliantly that they seem to be something surpassing the powers of nature itself. If the law of

finality were as universal in nature as the law of causality, if there were even no phenomenon in which it was not manifested, then we would cease to find this law miraculous as a law of nature, and would not be tempted to infer from it any supernatural intervention. For instance, because in a certain country, certain species of plants happen to grow which exactly serve for food or medicine to the animals of that country, or, again, because in a given country such animals are found as deliver the country from other animals that would be hurtful, this appears to us wonderful and surprising, because all natural events do not exhibit to us so immediately, in their reciprocal relation, so intentional and organic a connection. The poverty that nature presents, in the point of view of finality, inspires us with a certain distrust of the powers of that nature, a distrust that goos so far, that when an accomplished finality is really displayed in it, we usually prefer to have recourse to a miracle, rather than suppose any such thing accomplished by the powers of nature itself.

'This distrust of nature is very analogous to the distrust of misanthropes, as it is shown in the moral world. As the misanthrope is tormented by the morbid prejudice that human nature is too feeble to oppose evil, and that, consequently, there is no virtuous man in the world, so the physico-theologian lives with the prejudice that nature is too feeble and too impotent for a closer connection of its creatures than the connection of efficient causality; and in his illusion, where the true law of causality ceases, he draws the bolt, and beyond he prefers to believe in the miracle and in ghost stories rather than consent to the idea of a teleological process in nature itself.

'IV. Besides, on the teleological hypothesis the creator cannot be cleared of a certain feebleness, or a certain inclination to useless play, when he is seen to attain, by a grand apparatus of ingenious inventions, very small ends, which an Almighty Creator, such as He who is in question, should have

been able to attain by simpler means, and much more briefly, without creating for Himself useless obstacles in His way. Even Paley, the great admirer of the divine wisdom in the organization of animals, expresses his astonishment on this point, and sees no other refuge than in the incomprehensibility of God's ways: "Why," he asks himself, "has not the inventor of this marvellous machine (the eye) given the animals the faculty of sight without employing this complication of means?"[1]

'Again, the human eye is at once the most finished and the simplest of organs. Much less perfect, more insufficient, and a thousand times more complicated, are the thousand little tubes of the combined eyes of insects. Why has the wisest of creators had recourse in the creation of animals to so imperfect apparatus, when later He was to show by the fact, that the material of nature was capable of producing one much more perfect? Did He, then, find pleasure in realizing, only to vary, by imperfect and difficult means, what He could obtain much more quickly by more perfect means? Is such child's play, that creates obstacles for its own amusement, and indulges its humour in oddities and marvels, worthy of a wise Creator? He has shown in the stomach of man, the birds, and the ruminants, how many means were at His disposal to realize a process of digestion that should take place without effort: why have those means failed Him for serpents? and why has He permitted in this case the function of nutrition to be fulfilled by a disagreeable process, as fatiguing for the animal as repulsive to the spectator? These instances, and others like them, are fitted to awaken the desire for a less forced explanation of nature, in case such an explanation were possible.

'V. In fine, there is at the foundation of the physico-teleological proof a sentiment of the soul of quite another nature than that which results from the teleological calculation with concept of the understanding,—that is, an edifice

[1] Paley, *Natural Theology*, chap. ii.

added later, awkwardly to prop and magnify this instinctive sentiment. Nature, when we contemplate its works, fills us with wonder, and we feel ourselves spiritually, and as if sacredly, inspired. There breathes in us, as it were, a communion with the thousand creatures that burst forth in spring, and joyfully rush into life. We keenly feel the breath of a spiritual and vivifying power. Such a feeling is scarcely compatible with the point of view of a machine, so wisely ordained by an external mechanician that there is nothing more ingenious and better ordered than the fitting of its wheels.'

Such is the learned and curious reclamation of the Hegelian philosophy against the doctrine of intention. Let us briefly resume, while submitting them to a severe discussion, the preceding objections.

I. The first difficulty is this: There are numerous cases in nature where the tendency towards an end is not accompanied by the clear conception of that end. For instance, the tendency of bodies towards a centre, the instinct of animals, the inspiration of great men, are facts of this kind. If, then, these different forces are not to be recognised as immanent in nature, recourse must incessantly be had to the first cause without need, and we fall into *occasionalism*. In a word, immanent and unconscious finality, or *deus ex machinâ*—such are the two horns of the dilemma.

We reply that this dilemma sins against the fundamental rule of this kind of reasoning, which requires that there be only two possible alternatives, without intermediaries, whence the rule of the *exclusio tertii*. But here there is between the two opposite hypotheses a mean hypothesis, which the author omits, and which consists in supposing that there are, indeed, immanent forces in things, and forces unconsciously tending towards an end, but that this immanent finality is derived and not primitive, relative and not absolute. Between Hegel's hypothesis and Paley's there is room for that of Leibnitz, who by no means admits that we must incessantly have recourse to God as to a mechanician, without whom

the machine cannot go. He admits that God has placed in the thing at the first a certain force of spontaneity and energy, which is displayed conformably to an internal law without the necessity of the action of God being added to it, which force will be called, according to occasion, tendency, instinct, inspiration, etc. Such facts do not in the least prove that an activity can be conceived aiming at an end, without any notion of that end; for these forces, more or less blind and ignorant of their end, may be derived from some being that knows that end for them. Nay, this is the only means we have of comprehending this hidden and unconscious tendency towards an end. There is nothing in this that touches the principle, or is irreconcilable with it.

But is it possible, it will be said, to conceive that, even if created, blind forces can attain a certain end? And if this be granted, why should not an uncreated force equally attain it? We have here the true difficulty which Bayle, in a similar discussion on plastic natures, had already excellently perceived: 'But if a faculty without consciousness and reason,' he says, 'merely because it is created by an intelligent being, becomes fit to accomplish works that require intelligence, is it not as if it were said that, of two men equally blind, the one does not know his way, the other knows it because he has been created by a father with eyes? If you are blind, it matters little whether you were born of a blind or seeing father, for in both cases you always need to be guided by the advice and the hand of another. So, to regulate matter, it matters little whether plastic nature be born of an intelligent cause, if it is blind and knows not in what way to proceed to compose, separate, distribute, or reunite the elements of matter. Of what use is the power of acting without the faculty of comprehending? Of what use are legs to a blind man? . . . Consequently, if plastic causes are entirely destitute of intelligence, they must be continually directed by God as physical instruments.' Consequently, according to Bayle, the hypothesis of plastic natures, little different at bottom from the

Leibnitzian forces, either reverts to pure mechanism and occasionalism, or leads to the negation of a supreme cause ; for if a blind force, tending towards an end and attaining it, implies no contradiction, we cannot see why such forces should any more imply a contradiction because existing of themselves.

To this we reply, with J. Leclerc, the defender of plastic natures : What implies contradiction is not the fact of a blind force tending towards an end, since experience shows us such, but is just the hypothesis of such a force existing of itself; for in that case we do not see whence it can derive the determination towards the end, and the exact choice of means leading to it. If, on the other hand, such a force is only derived, the reason of its determinations is in the intelligence of the cause from which they emanate. What, says Bayle, does it matter, if the force is blind, whether it have as author an intelligent being ? What matters it whether a blind man be born of a seeing father ? To solve this difficulty, let us borrow, like Bayle himself, our examples from experience. Every day we see intelligent beings communicate to other beings dispositions and impulsions that direct them unconsciously towards a determinate end. This takes place, for instance, in education. Parents insinuate by example, by a certain tact, by caresses, etc., a thousand dispositions and inclinations into the soul of their children, of which the latter are unconscious, and which direct them, without their knowing it, towards an end they know not of,—for instance, virtue, wisdom, happiness. Such dispositions, however, are really incorporated in the soul of children, are blended with their natural qualities, become proper to them, and are later truly spontaneous principles of action to them. In this case, then, we clearly enough see how an intelligent cause might originally place in created beings certain dispositions, potencies, or natural habitudes, which should be inherent, immanent, and essential to them, and which should conduct them to their destination without their knowledge, and without the Creator needing to act for them and guide them, as the husbandman

the plough. A thousand instances, derived from physiological and moral experience, might be quoted of this premeditated infusion of certain principles of action into souls that are unconscious of them, and that then obey them spontaneously and blindly. And men make use of this power as well for evil as for good. A skilled seducer, for instance, will know how to determine in an innocent mind certain unconscious impulses that will lead it unwittingly to the end fixed by him—namely, towards its ruin or misfortune. An orator or a politician will call forth in crowds commotions which, once excited, will lead to this or that consequence, foreseen by him and not by them. Thus the Creator might determine in bodies or in souls certain impulsions or tendencies leading them inevitably to the end fixed, reserving to man alone, and still within a limited circle, the faculty of acting like Himself, conformably to a premeditated end.[1]

In truth, it will always be possible to oppose hidden qualities, which, being neither mechanisms nor systems of thought, present nothing clear to the mind, and to say, with Descartes, that we only comprehend two things clearly and distinctly, thought and motion (or any other modification of space); and this objection is at bottom that of Bayle, who opposes the dynamism of Cudworth from the point of view of Cartesian *occasionalism*. But this point of view cannot be that of the German philosopher we are discussing, for he shows himself opposed to every species of mechanism, whether the mechanism of Epicurus (that without God) or the Cartesian mechanism (that with God). He thus necessarily admits something like hidden qualities, under the names of *tendencies, instincts, inclinations, inspiration, enthusiasm.* He has, consequently, nothing to object to those who will admit the same hidden faculties, on condition of supposing them to be derived and

[1] One may conceive this creation of impulsions in things either as a supererogatory act of God, adding to beings, when once formed, the instincts or powers they have need of, or else (which would be more philosophical) one may admit that God has at once created beings and their instincts, the nature of things being but the sum of the powers or instincts of which it is composed.

not primitive; and from the point of view of the explanation of these notions there is no advantage in conceiving these sorts of qualities as existing by themselves in place of being communicated properties.

There are, besides, in the facts quoted by the author, many differences to be noticed. One might even dispute regarding the approximation of mechanical tendency and instinct; but what cannot be in any way assimilated is the fact of instinct and that of inspiration.

Instinct is a phenomenon entirely blind, routine, machine-like, always like itself. It may vary more or less under the influence of circumstances; but as these modifications are slow, rare, and infinitely little, the dominant character of instinct is no less monotony, servile obedience to a blind mechanism. Inspiration is of quite another order; its proper character is invention, creation. Wherever there is imitation, or mechanical reproduction of a phenomenon already produced, we refuse to recognise the character of inspiration. The property of instinct is precisely to resemble a work calculated and arranged beforehand. Thus the bee, in choosing the hexagonal form for depositing its honey, acts precisely as an architect would do, who should be asked to construct the most pieces possible in a given space. On the other hand, the property of inspiration is in nothing to resemble calculation, and to be incapable of being in any way represented by calculation. For instance, when a poet wishes to paint a great sentiment, it would be impossible for him to find laws of combination permitting him to attain his end; he could not say: By combining words in such a way I shall be sublime. For the words must still be given him; and by what means could he find such words rather than others? In artificial works (and what renders instinct so marvellous is just that it produces such works), it is by the combination of parts that we succeed in producing the whole. In works of art, on the other hand, it is the whole that commands the arrangement of the parts. For instance, although a musical

theme is necessarily successive, in virtue of the laws of time, yet even the first notes are dominated by the entire air; and one cannot imagine a musician adding note to note in order to reach an end, for that end is the entire air, and the air is in the first notes as well as in the last. No doubt, there is even in inspiration a part to be done by reflection, calculation, and science, as we shall show immediately; but the essence of inspiration is something entirely different, and cannot be conceived as a calculated combination.

These observations may appear at first sight more favourable than otherwise to the objection of the German philosopher; but our aim is first clearly to distinguish inspiration from blind instinct, two things that this philosopher puts almost on the same line as proving the same thing, wherein he deceives himself. No doubt the fact of artistic inspiration can quite prove that there is a sort of finality superior to the finality of foresight and calculation, that the soul attains its end spontaneously, while the mind laboriously seeks and combines the means of attaining its end. Where the versifier employs with consummate ability all the resources of the art of versification, to leave the reader cold while amusing him,—where the rhetorician calls to his aid all figures made to order, to persuade, please, and move according to rule,—a Corneille and a Demosthenes find in their heart unexpected words, sublime turns, whose origin they themselves cannot explain, and which astonish and elevate the soul of the spectators and auditors, and soul speaks to soul. Where shall one discover the like of *Qu'il mourût,*[1] or, *Je ne te hais point?*[2] By what process? by what recipes? And how superior is emotion here to calculation! But if one may conclude from these facts that the highest finality is not perhaps that which results from a deliberate combination, still how can we confound this inspiration, in which the ancients saw the seal of the divine, *τὸ θεῖον*, with a blind instinct, with the mechanical and routine course of a watch that goes alone, which is what

[1] Corneille, *Horace*, act iii. scene 6. [2] Corneille, *Le Cid*, act iii. scene 4.

the instinct of animals resembles? Inspiration may be superior to calculating intelligence, but intelligence remains very superior to instinct. The soul inspired by sentiment is not a blind activity. It is conscious of itself; it has a vivid and profound intuition of its end; it is quite full of it; and it is precisely this vivid sentiment of the end that evokes in it its own realization. In this case, as Hegel says, 'the end realizes itself.' Instinct, on the other hand, not only is ignorant of the means, but of the end. Far from creating anything, it does nothing but repeat and imitate, without even knowing that it imitates what has always been done. The first animal of each species could alone be truly called an inventor. But there is no reason to attribute to it in preference to its posterity such a superiority of genius. For if it had been capable of such an innovation, why should its successors be reduced to a sterile and routine imitation? Doubtless the creation of instinct supposes genius; but instinct is not genius, and is even the opposite of it.

Moreover, we have hitherto reasoned on the hypothesis whereby inspiration would only be a purely spontaneous act, in which intelligence should have no part. But nothing is more contrary to the truth. Every one knows the old disputes between art and genius. No doubt art is not genius. Rules do not suffice to make masterpieces; but who does not know that genius is only complete when accompanied by art? How many parts of the beautiful are derived from intelligence and science! The wise arrangement of a subject, the division and gradation of the parts, the elimination of useless parts, the choice of times, places, circumstances, the adaptation of the style to the manners and sentiments of the personages—these for the dramatic art. The investigation of proofs, their distribution, their clever gradation, the skilful interweaving of dialectic with the pathetic, the accommodation of the sentiments and motives to the habits and dispositions of the auditory—these for the art of oratory. The combination of harmonies or colours, rhythm, the contrasts of

light and shade, the laws of harmony or of perspective—these for music and painting. In architecture, the part of science is greater still; and even industry comes into play. Thus even in the labour of inspiration, science and art—that is, calculation, foresight, and premeditation—play a considerable part; nay, it is almost impossible rigidly to distinguish what is of art and what is of inspiration itself. No doubt the original conception of a character like that of the *Misanthrope*, or, in another class, the *Olympian Jupiter*, can only be referred to a first stroke of the creative imagination. What means, in effect, can be employed to conceive a primary idea? At the very most, the artist may place himself in circumstances favourable for invention. But the primary idea once given, what is it that fertilizes, animates, colours, and realizes it but art, always, it is true, accompanied by inspiration? Is there not here a part to be played by calculation and thoughtful combination? Will not reflection, for instance, suggest to the author of the *Misanthrope:* To attain the comic, I must put my principal personage in contradiction with himself. I must then give him a weakness, and what weakness more natural than that of love? And to render the contrast more striking, and the drama more comical, I will make him love a coquette without soul, who will play with him. I will bring them together, and the man of heart shall humble himself before the selfish and frivolous fine lady. Besides, this coquette must be a perfect woman of the world; and to depict her as such I will have a conversation scene, where I will paint the *salons* in all their charming frivolity. That Molière made these calculations, or others like them, cannot be doubted, although at every step he needed genius—that is, inspiration—to realize his conceptions; for it is not enough to say, I will have talent,—the great thing is to have it. But mind can no more be found by means of reflection than genius. Every one knows, on the contrary, that to seek talent is the best way not to find it. In music, inspiration properly so called plays a greater part; but even here there

are skilful combinations that may be the result of reflection, and produced intentionally. For instance, it may very well be the case that it was after reflection, and voluntarily, that Mozart resolved to accompany the amorous serenade of Don Juan, that air so melancholy and touching, with the playful refrain that inspired some well-known, charming verses of Musset. Donizetti may also very well have calculated beforehand the profound effect produced on the heart by the singing of Lucia's obsequies, interrupted by Edgar's marvellous final air. At every moment one may find in the arts examples of great beauties gained by calculation and reflection. In *Athalie*, for instance, the introduction of choruses, the prophecy of Jehoiada, the bringing together a divine child and an impious queen; in *Horace*, the idea of cutting in two the narrative to produce a sudden dramatic change; in the *Descent from the Cross* at Antwerp, the skilful and difficult combination that makes all the personages in some measure bear or touch the body of Christ,—are striking examples of beauties desired, premeditated, and prepared by esthetic science, on condition, no doubt, of finding a powerful imagination for their realization. These striking examples of an intelligence at the service of inspiration might incline us in favour of Schopenhauer's theory, that makes intelligence the servant of the will, if we agreed to attribute inspiration to what this philosopher calls the will;—as if inspiration itself were not already a sort of intelligence; as if the first conception, the immediate work of the creative imagination, were not also an act of intelligence; as if, in fine, love itself, which impels to create, to engender, as Plato says, were possible without a certain view of the object loved. All that can be said—and it in no way contradicts the doctrine of final causes—is that above the *combining* and *calculating* intelligence, there is a primary form of superior intelligence, which is the condition of the second, and which may be called *creative.*

If, then, we seek in experience some type or model that may give us an analogical idea of the primary activity, we

will not refuse to admit that inspiration is that which, perhaps, in fact comes nearest to it. At this elevation intention becomes lost in finality,—that is, the means confound themselves with the end; but far from such a conception confining us within the circle of nature, it is only, on the contrary, by leaving nature that we can conceive such an identity of means and ends. It is the property of nature, on the other hand, to pass by the one to the attainment of the other, which is impossible to a blind force, not directed. Foresight, as it is manifested in the secondary substances, is not, perhaps, the highest expression of finality; but blind instinct is a still less faithful expression of it, and pure mechanism is its absolute negation.

If, moreover, we analyze the idea of intention, we shall find in it two elements:—1st, The art of willing the end, with the consciousness that we will it; 2d, The choice of means to attain it. But in the phenomenon called inspiration, intention exists in the first sense, although not always in the second. The artist will express what he has in his soul, and he is conscious of this volition; but how is he to express what he has in his soul? He does not know. Does it follow that a higher intelligence would know no more? Is what is unconscious in artistic creation a necessary element of creative genius? On what ground could such an hypothesis be maintained? It appears that the highest degree of genius is just that which has the completest consciousness of its power. As there is more consciousness in genius than in mere instinct, so what may be called absolute genius should be accompanied by absolute consciousness.

Supposing, then, that there is a supreme act, of which artistic inspiration can give us some idea, this absolute act should be not the act of a blind force, or of a fortuitous mechanism, but of a creative intelligence, inventing at once means and end by a single act, and in which, consequently, foresight should be identical with immediate conception. It is in this sense that it may be allowed that intention is not

necessary to finality; not that it is absent, as in ignorant instinct and in the blind forces of nature, but rather that it has become useless, because, being in no way separated from its end, conception and execution are for it but one. But we will return to these ideas: this is not yet the place to give them all their development.

This first objection being much the most important, we have had to dwell the longer upon it; we will pass more rapidly over those that follow.

II. The German author appeals against the intentionalist doctrine to what he calls mathematical finality, without explaining very clearly what he means by it. No doubt he means to say that, to render any regular figure possible in geometry, its lines must be arranged in a certain way; but this pre-arrangement of the lines in relation to the general figure is something analogous, not to say similar, to the arrangement of the members in the organism; it is an adaptation to an end. Yet in this case, he says, no one supposes an intentional arrangement, no one infers a wise author, who has ordained all that, conformably to the end, by the most simple means. Why, according to this author? Because mathematical figures have no relation to our convenience, and their fundamental relations are absolutely indifferent to us.

There is here, as it seems to us, much confusion of ideas. But to come at once to the main point, we may say that Kant, from whom the principles of the objection are borrowed, has himself, with his usual profundity, furnished the solution of them. It is, that in mathematics we have to do, not with the *existence* of things, but their *possibility*, and, consequently, there can be here no question of 'cause and effect.'[1] This is why Kant gives to this finality the name of 'finality without an end,' which equally applies to esthetic finality. Kant's explanation amounts to that of Aristotle, according to whom mathematical entities are fixed,—that is, are not subject to generation. But where there is no genera-

[1] *Critique of the Judgment*, § lxii. note.

tion, there is no cause and effect (except by metonymy); and where there is no cause and effect, there can be no means and end, for means are nothing but a cause fit to produce a certain effect, which, therefore, is called an end.

If, however, instead of conceiving geometrical figures as pure abstract possibilities, they be taken as concrete forms, which matter really assumes under determinate conditions, — for instance, in crystallization,—there will, in fact, be room to inquire how certain blind materials come to be arranged conformably to a determinate order; and a definite reason will evidently be needed to explain why they take this arrangement rather than another, since particles left to chance would assume a thousand combinations before hitting on those simple figures that geometry designs and studies. In this case we will be entitled to suppose that these molecules move *as if they aimed* to produce a determinate geometrical order; and to affirm that in this case there is a finality without intention, is to assume precisely what is in question; for it does not follow as of course that any cause can spontaneously, and without knowing anything of what it does, direct its motion according to a regular law and conformably to a determinate type.

Thus it is not because geometrical proportions and relations have no reference to our use, as Fortlage supposes, but because they are pure ideas, that we do not assume intentional arrangements in geometrical figures. But as soon as these figures are objectively realized in the real world, we raise exactly the same question as regarding the most elaborate arrangements.

Besides, it is not true that human utility is the sole criterion of finality and intentionality. We admire the structure of animals and plants, even in the case of creatures that are of no use to us; and if bees' honey were of no more use to us than their wax, it would be enough that these two products are useful to themselves to make us admire the industry that yields them. Still more, we recognise finality even in beings hurtful to us, and, as Voltaire says, the very fly should own that the spider weaves its web with wondrous skill.

Thus it is the internal agreement of the object, and not its relation to us, that determines our judgment of finality; and if, in place of conceiving geometrical figures as externally self-existent, we saw a luminous point moving in space, and turning round a centre, drawing a curved line, without ever increasing its distance in relation to that centre, we would then seek a cause for this motion, and could not conceive it except as the act of a mind and an intelligence.

III. It is the very rarity of the fact of finality, it is said, that makes us infer a cause apart from nature, and an intentional cause analogous to our own. If finality were displayed in all phenomena like causality, we would have no more difficulty in attributing the one than the other to the power of nature; but these facts being scattered, we judge nature too feeble to produce them, and think it necessary to have recourse to a miracle to explain them. Fortlage, in this connection, ingeniously compares this distrust of nature in general with the misanthrope's distrust of human nature.

Here, again, there is much confusion of ideas. The question whether the cause of finality is within or without nature is not the same as this, whether that causality is intentional or blind. Intentionality and transcendence are, as we have repeatedly said, two different things. One may conceive an immanent natural cause (a soul of the world, for instance), which, like the Providence of the Stoics, should act with wisdom and foresight. One may, on the other hand, conceive a transcendent cause, like the pure act of Aristotle, which should act on nature unconsciously, and by a sort of insensible attraction. Thus we should not necessarily exclude intelligence from finality if we proved that the cause of finality is within, not outside, nature. Consequently, if this kind of distrust, with which, according to the author, the forces of nature inspire us, were to disappear, and we were brought to consider it as the sole and sufficient cause of finality, it would still remain to inquire how nature can attain its end without knowing it—how it can have adapted means to ends, while

knowing nothing of either; and the hypothesis of a finality without foresight would still remain incomprehensible. Thus it is not our distrust of nature that compels us to recognise intelligence in its works.

An example will render our distinction evident. Suppose a poet, regarded as mediocre, and of recognised tameness, were to produce by chance some brilliant work, some beautiful verses, it might be supposed that he was not the author of his work, that some one prompted and inspired him, although, in reality, there is nothing impossible in genius being manifested only in sudden leaps and intermittent flashes. There is more than one instance of a poet having produced but one sublime piece, and relapsing into the night of mediocrity. But if this poet, on the other hand, were then continuously to produce a succession of masterpieces, our distrust would disappear, and we would no longer need to seek elsewhere than in the genius of the poet himself the inspiring principle of his writings. But would we thereby have in the least degree proved that genius is a blind force, not self-possessed, foreseeing nothing, and acting without light and thought? So nature might be the proper cause of its products without our being entitled to draw any inference against the existence of an intelligence in nature itself.

It will, no doubt, be said that, experience giving us no sign of the immediate presence of an intra-mundane intelligence, we can only conceive a supreme intelligence by supposing it at the same time extra-mundane. We grant it; and it is one of the most decisive reasons in favour of the transcendence of a first cause. But, after all, the question of transcendence raises difficulties of another kind; and, therefore, it should be distinguished from that of an intelligent first cause. For instance, the difficulties that arise from the idea of creation *ex nihilo*, those which arise from the idea of substance, from the exact distinction between the first cause and secondary causes, are independent of those that are raised against the hypothesis of a pre-ordaining foresight. Accordingly, we

say that this hypothesis may be disengaged from that of transcendence—that it rests on its own reasons, whatever the degree of intimacy attributed to the first cause in relation to nature.

Let us now add that, even if finality were as universally diffused through nature as causality, there would still be no occasion to set aside the idea of a contingency of nature, *contingentia mundi;* for this contingency affects causality as well as finality. Because all the phenomena of nature have a cause, it does not follow that that cause is immediately the first cause, and that there are no second causes; but nature, being by the very definition only the totality of second causes, is not in itself its own cause. Now, if finality were universal, like causality, it would simply follow that all that we call cause would become means, all we call effect would become end; but the chain of means and ends, no more than that of causes and effects, would be confounded with the absolute, and the question of contingency would remain intact.

IV. A new difficulty proposed by the German author is that the hypothesis of an intentional finality cannot explain the errors of nature, and the groping with which it gradually advances towards its end. This objection has already been discussed above;[1] we need not revert to it. Let us merely say that, if the idea of a sovereign and absolute wisdom excludes the idea of groping, it is not so with the idea of a *nature* created by sovereign wisdom. The groping or gradation, in fact, may be the only means that a nature has at its disposal to express the absolute perfection of the creative act that gives birth to it. We will add that, if nature seems to you powerful and rich enough to be itself declared divine, *à fortiori* it must be beautiful enough for an image, shadow, or expression of the divine act.

V. The last objection is particularly interesting. It tends to put in opposition the belief of God's existence to the sentiment of nature, such as men feel it at the present time. It

[1] See chap. vi. p. 222.

seems that to love nature it must be considered as divine, and not merely as the artificial work of the Deity.

No doubt it would be a great exaggeration to say that theism is irreconcilable with a lively sense of the beauties of nature. Nowhere have these beauties been more eloquently described than in the writings of Fenelon, Rousseau, and Bernardin de Saint-Pierre, which are directly intended to prove the existence of a Providence. But what might perhaps be maintained is that a certain manner of loving nature, and that precisely which has been developed in our age, supposes another religious philosophy than that of the Savoyard vicar. The old theodicy, it will be said, that conceives a God fabricating the universe as a watchmaker makes a watch, behoved to engender an entirely similar esthetic. Nature, to be beautiful, behoved to be arranged, cultivated, combed, pruned. The beautiful must exclusively consist in the proportion of parts, in a harmonious and sweet agreement: everywhere there were required in works of art plans well arranged and methodically executed. The earth was only a machine,—that is, something cold, dry, more or less agreeable in parts, but without internal life, without flame, without a divine spirit. But since a new philosophy has taught us the divinity of nature, now that all is full of gods, *πάντα πλήρη θεῶν*, the grand poetry of things has been revealed to us. The voice of the ocean, the roar of the winds, the abrupt depths produced by the elevation of the mountains, the splendour of glaciers, all speak to us of an ever-acting, ever-living power, that has not retired into its solitude after having acted one single time, we know not why, but which, on the contrary, is always here in communication with us, animating this nature that is called dead, but is not, since it speaks to us with accents so pathetic, and penetrates us with seductions so intoxicating. Here is God; and Goethe did not mean to lessen Him when, like the old Indians, he saw Him everywhere in the rocks, forests, lakes, in that sublime sky—in that totality, in short, of which He is the eternal soul, the inexhaustible source. The theist, on the other hand, only

admires His cold and pale image, the wretched copy of His eternal perfections,—an insipid work that He has created without knowing why, tired, no doubt, of His immoveable eternity.

This whole argumentation supposes that, on the hypothesis of a supra-mundane and intelligent cause, nature would be no more than a machine, and the Creator could only be a workman, which would be to compare the divine activity with the lowest human occupations,—that is, with handicrafts. These are very exaggerated consequences, derived from a metaphor. The comparison of the universe to a watch is one of the most convenient presented to the mind, and philosophy is no longer possible if every figure is forbidden on pain of being taken literally. The mechanism existing in the universe, and which may be considered by itself abstractly, warrants such a comparison, but does not exclude others. Because the Author of things has had regard to utility for His creatures, it does not follow that He has not had beauty in view also. As Leibnitz has said, mechanism does not exclude metaphysic. The architect who builds a temple like the Parthenon may have made a sublime work while occupying himself with its solidity. Whether immanent or transcendent, intentional or blind, the Cause of nature has been obliged to employ material means to express His thought, and the just combination of these means, to make a stable and solid work, is imposed quite as much on the God of pantheism as on the God of creation; and, conversely, the employment of these material means, wisely combined, no more forbids the beautiful or the sublime to the God of creation than to the God of pantheism. If, then, the adherents of a transcendent and intentional cause have specially attached themselves to examples drawn from mechanics, it is not that they are more bound than others to maintain that everything in nature is mechanism, but that there is here one of those *privileged* facts in which is strikingly manifested the proper character of an intentional cause; and philosophy, as well as the sciences, is entitled to appeal to the most decisive facts, even though they should appear low

to a false imagination. And besides, when it concerns the mechanism of the universe and the conception of the system of the world, who will venture to say that that is a small matter, and that the admiration which such a work must inspire is really unworthy of the Divine Being?

Thus those who have said that the world is a machine, are in no way deprived of the right to say that it is a poem as well. Wherein does the one exclude the other? The system of the world for geometricians is certainly only a mechanism. Does any one believe, however, that a geometrician will therefore become insensible to the beauties of the starry heaven and the infinite immensity? Will it be disputed that a building, in order to stand, needs to obey the laws of the exactest and driest mechanics? The gigantic arches of Gothic cathedrals are not supported by miracle. It is not angels or hidden powers that support their stones, but the abstract and dead laws of gravitation. And yet, is the mysterious grandeur of these mystical monuments less overwhelming, divine, and pathetic on that account? The soul of the architect has manifested or embodied itself in these dumb stones, but it has only been able to do so by observing the laws of mechanics. Why cannot the divine soul, if we may use such an expression, have also passed into its work, whether mechanical or not? Is it necessary that the architect's soul be present in the building substantially in order that it may be truly there? Is there not a kind of ideal presence, the thought of the Creator being communicated to His work, and existing apart from Him, but by Him? Will it be said that the divine hymn of Stradella has not retained something of the soul of its author, although he is no longer here to sing it? Thus, that nature be beautiful, touching, and sublime, it is not necessary that God be present in it substantially; it is enough that He is there by representation, as a prince is present wherever his ambassador is, and communicates to him his dignity, without needing to be present in person.

Thus the esthetic objection proves nothing in favour of an

instinctive and against an intentional finality. Nature, were it only a vast mechanism, might still be beautiful, as expressing a divine thought, just as the succession of the sounds of an instrument may be something sublime, although, for the physicist, it is only in reality a purely mechanical combination. But we have seen, besides, that the doctrine of transcendent and intentional finality is by no means obliged to reduce everything to mechanism. Nature may be composed of forces without being itself the supreme and absolute force. In fine, the species and degree of the participation of things in the Divine Being is one question, and intelligence in the ordaining cause is another. Were the world nothing but the phenomenon of God, there would still be room to inquire whether it is a phenomenon developed in the way of blind instinct, or of enlightened reason. But on the latter view it is not apparent why nature should be less beautiful than on the former.

In a word, the fundamental error—the πρῶτον ψεῦδος of this whole otherwise very learned discussion—is the perpetual confusion between two distinct questions, that of immanence and that of intentionality, immanence not excluding intentionality and wisdom in the cause; and, secondly, the vagueness and indecision in which this term immanence, interiority, which is imputed to the first cause, is left. For immanence is not absolutely denied by any one; the only question is as to the degree, but the degree is not fixed.

Other difficulties have recently been raised among us against the hypothesis of an intelligent, and in favour of an instinctive, finality. Here, for instance, is how a contemporary philosopher expresses himself: 'We can only conceive in three ways the relation established in a system of phenomena between the end and the means. Either, in effect, the end exerts an external and mechanical action on the means; or that action is exerted not by the end itself, but by a cause that knows and desires to realize it; or, finally, the means arrange themselves in the fit order to realize the end. The first hypothesis

is absurd, since the existence of the end is posterior in time to that of the means; the second is useless, and blends with the third, for the cause to which recourse is had is only a means not essentially differing from the others, and to which is accorded, by an arbitrary preference, the spontaneity denied to them.'[1]

In this passage it must be confessed that the author of this objection frees himself very easily from a traditional doctrine, defended by the greatest spiritualist and religious philosophers. It will not easily be allowed that the doctrine whereby *intelligence co-ordinates the means,* is reducible to that whereby '*the means arrange themselves in the fit order* to realize their end.' May we not here say with Fenelon: 'What is stranger than to imagine stones that grow—that come out of the quarry, that ascend upon each other, leaving no space, that carry with them the cement to unite them, that arrange themselves so as to provide apartments, that receive beams above them to roof in the work!' Why, if I say that an architect has chosen and foreseen the means necessary for building, is it as if I said that these means all alone arranged themselves to build the house? To say that intelligence is only itself a means like the others, is even a very inexact expression. For can that be called a means that serves to discover means—to choose and distribute them? But even if so improper an expression were admitted, the question would remain the same as before—it would still be the question, whether the first means, and the condition of all the others, is not the knowledge of the end and the enlightened choice of the subordinate means. At least it would be necessary to distinguish between the principal and the secondary means, the one being the condition *sine quâ non* of all the others. Thus nothing would yet have been proved. To maintain that 'knowledge only produces action by *accident*,' is one of the strangest doctrines that can be maintained in metaphysic; for it would follow that, precisely on the hypothesis of intelligence, actions would

[1] Lachelier, *Du fondement de l'induction*, p. 96.

be *fortuitous*,—that the doctrine of Leibnitz would be the doctrine of chance, as well as that of Epicurus. The reason given for this paradox is as unsubstantial as the opinion itself is singular. For it is said intelligence can only conceive an end if feeling already impels us to it; thus it is useless. Every phenomenon can only be the result of a tendency. The knowledge that is added to the tendency adds nothing to it. I grant that the tendency towards an end needs no intelligence; but between the tendency and the end there is an interval,—there are intermediaries, middle terms that we call means. The question then is, whether the tendency towards the end suffices to explain the choice and adaptation of the means. This is what the author does not take the trouble to prove, while it is the true point of the difficulty.

Tendency is one thing, *preordination* is another. To tend *towards* an end is not synonymous with acting *for* an end. These two finalities must be distinguished. The one might be called finality *ad quod*, the other finality *propter quod*.

Hunger, for instance, is a tendency. It is not the same thing as the industry that finds food. And if it be said that the pursuit of food is only itself the result of a tendency,—that, for instance, the animal goes towards what procures it pleasure, the insect towards the flower to which its smell or sight leads it,—it is not perceived that the question just is, how the particular tendency that impels it to satisfy a certain sense is exactly in agreement with the general tendency that impels it to desire preservation.

Let us take, for instance, the love of glory in a young man. This end can only be attained by the successive satisfaction of a multitude of partial tendencies; and the problem is how all these partial tendencies shall be subordinated to the dominant tendency. In youth, in point of fact, there is an immensity of other tendencies, which by no means harmonize with the tendency towards glory, and which are even very contrary to it; but it is the intellect and the will that exclude the one to satisfy the others. How does this elimination take

place in brute and unconscious agents? How does the brute cause, imbued with innumerable tendencies towards an infinite number of objects, only obey those of them that conduct it to objects useful for its end? For example, how does the vital force, or whatever cause produces the organism, being the subject of a thousand chemical, physical, and mechanical tendencies, which could determine millions of possible combinations, exclude among all these combinations those that do not contribute to the end? And to say that it is by a sort of groping that nature discards successively the bad chances that arise, and ends by hitting the happy chance that satisfies the problem, would be to prove too much; for this explanation avails not against intentionality, but against finality itself.

To sum up. There is a common tendency at present in several schools to adopt a middle theory between the Epicurean theory of fortuitous combinations and the Leibnitzian of intelligent choice. This is the theory of instinctive finality, sometimes arbitrarily called the Will. This mongrel theory is nothing else than the old theory of hylozoism, which attributes to matter sympathies, antipathies, affinities, preferences,—things that are all absolutely opposed to the idea of it. All that can be attributed to matter, as regards power, is the capacity to produce motion. As to the direction of the motion, and the choice between the possible combinations of motion, it is an indefensible anthropomorphism to explain it by a second mysterious view, that consists in seeing without seeing, in choosing without knowing, and combining without thinking. Say simply that the adaptations of matter are only appearances and results; but to attribute to nature a desire without light, an intelligence without intelligence, an esthetic and artistic faculty that could dispense with consciousness and knowledge, is to take metaphors for realities,— *μεταφορικῶς καὶ κενῶς*.

The only substantial thing remaining in the objections that may be made against intentionalism is, that our vision always becomes obscure and dim when we come to the mode of action

of the first cause, as our experience only gives us to know second causes. Thus no other course is left to us than to say nothing at all about it, as the Positivists do, or to speak of it by comparison with ourselves, always endeavouring to exclude whatever is incompatible with the idea of the perfect and absolute. There is no other method of determining anything of this first cause than the *negative*, excluding from God whatever belongs to the finite character of the creation; and the *analogical* method, attributing to God, *ratione absoluti*, everything with a character of reality and perfection. Every other method, pretending to discover *à priori* the attributes of the primary being, is a pure illusion; and even those who conceive this first cause as an instinct, and not an intelligence, do yet but borrow their type from experience.[1]

Thus it will be admitted that all foresight similar to that of man, and which implies time and difficulty, can have no place in the absolute. Is that to say, however, that all foresight is absent from it, as in blind instinct? Or is there not something that represents what we would call foresight, if the divine act were translated into human language? This is the question.

Let us examine, then, more closely this idea of foresight, as it occurs in human consciousness. It seems to imply two things incompatible with the absolute:—1st, The idea of preexisting matter, whose laws and properties must be mastered, and at the same time utilized; 2d, The idea of time.

1. Why has man need of foresight in preparing for the ends he pursues? Is it not because he finds before him a nature which, not having been made exclusively for him, presents a multitude of bodies submissive to laws which, in their actual form, do not in any way promote our convenience,

[1] The learned philosopher whose opinion we have just discussed, will perhaps say that in the passage quoted the question is only as to nature, and not as to the first cause. But no one maintains that nature as such is an intelligent cause; it is meant only of the first cause. In denying, then, absolutely that finality is directed by intelligence, the author by implication makes his denial bear on the first cause.

and are even oftener hurtful than useful to us, so that nature might have been as often presented under the aspect of a step-mother as of a beneficent mother. Man, thus finding resistance in external forces, is obliged to calculate in order to overcome this resistance, and to make it subserve his designs. No doubt, indeed, given a determinate end, and pre-existing matter not prepared for that end, this matter can only be adapted by foresight, which is nothing but the reciprocal of experience. But could such a notion be comprehended in an absolute cause,—absolute mistress of the possible as of the real,—and which, being able to produce all by a sovereign *fiat*, has no difficulty to foresee, no obstacle to surmount, no matter to accommodate to its plans?

On this first point, we reply that there is no necessary connection between the idea of foresight and that of pre-existing matter. In fact, when I pursue an end, I can attain it either by employing means that are not at my disposal, or by creating the means themselves; and although in the case of man this creation of means is never other than metaphorical, as the matter pre-exists, it is clear that the operation would not change its nature, if, in place of producing means by borrowing them from nature, I were endued with the faculty of absolutely creating them. For instance, to attain some end,—say, to make a *metre* to remain without alteration during so many years,—I need a metal hard enough not to change during that number of years, capable of resisting a certain degree of temperature, and which has so little marketable value as not to tempt cupidity; and not finding this metal in nature, I produce it by the aid of certain combinations. Is it not evident that if I could produce it immediately, the operation would remain the same? and this matter, once created, would still have to be put in relation to the end, by adapting it, so that the creation of the means in no way excludes the adaptation of the means. Thus, granting that a given effect is an end (which is the hypothesis allowed at present by common consent), the production of the fit matter for this end is as

much the effect of foresight as the adaptation of it in this manner would be. For, first, the production requires the adaptation besides; and, in the second place, that production itself is already adaptation, for we must first choose *this* matter, and then give it *this* form. Omnipotence being able to create every kind of matter without end, to create those that contribute to the end, and not others, is itself an act of adaptation; and, so far as the previous conception of the end should have determined this creation and not another, it is what we would call an act of foresight.

2. To what extent, however, can the term foresight, or intention, be here employed to represent the creative act? This question may still be asked. The creative act is absolutely one and indivisible; and, consequently, there can be no distinction between a consequent and an antecedent volition. That act not being in time, there is neither a *post* nor an *ante;* and our youngest scholars know that prescience or prevision is only an immediate vision. That is true; but if, on the other hand, the act be considered, not in its supernatural origin, but from the point of view of nature which is subject to generation, the act will be decomposed into diverse elements, and so far as the last is called end and recognised as such, the antecedents will be *pre*ordained in relation to that end; and if the whole act be considered as the act of an immediate knowledge or vision, the antecedents, relatively to the consequents, will be legitimately called acts of prevision. This will simply mean that no blind cause can have produced such acts; that they are acts of reason and of absolute reason; and that this absolute reason, so far as it is regarded in its effects, acts *as if* it were endued with foresight, prescience, and intention.

We do not hesitate to declare that the doctrine of an adequate conception of the absolute in the human mind cannot be maintained in philosophy. To say that things occur in the divine nature exactly in the way we conceive them, would be to pretend that we can see God face to face, which,

according to theology, is only possible in the future life. We only know God, according to Bacon, by a *refracted ray*, which evidently implies under a point of view that modifies the object,—in other words, in a *symbolic* manner. Thus we are not far from admitting with Kant that the doctrine of intentional finality is a doctrine relative to the mode of representation of the human mind, a *hypothesis*. Things occur, we say, *as if* a supreme wisdom had regulated the order of things. In these terms I do not believe that any philosopher can dispute the results of Kant's criticism. For what philosopher would ever dare to say, I know God as He is in Himself? And yet this is what must be said, if it be not granted that all our conceptions of God have something relative and subjective belonging to the imperfection of our faculties.

But while Kant absolutely maintains the subjectivity of human conceptions, and, enclosing us within an impassable circle, leaves beyond it only an absolutely indeterminate x, we admit, on the other hand, that these conceptions (when they are the results of the right use of our faculties) are in strict relation to things as they are in themselves, as the stick broken in the water strictly corresponds to the real stick, as the apparent heavens enable astronomers to discover the laws of the real heavens. By analogy we maintain that, if the highest manner of humanly conceiving the first cause of finality is the hypothesis of a supreme wisdom, this conception, to him who could penetrate to the deepest foundation of things, would be strictly translated into an attribute corresponding to the perfect being, so that *goodness, wisdom, justice*, and, in general, what are called the moral attributes of God, are not mere names relative to our way of feeling, but symbols, approximations more and more faithful to the absolute essence, considered in its relation to sensible things.

Consequently these approximations (as symbols of the absolute), assuming an objective and ontological character not possessed by pure poetic fictions, which are absolutely sub-

jective, these approximations should be pushed as far as possible, taking most carefully into account the two data of the problem,—on the one hand, the facts to be explained; on the other, the nature of the absolute. Thus, foresight being given as the only attribute intelligible to us that can explain the facts of finality, we ought, on the other hand, to free it from all that is incompatible with the idea of the absolute, and the residue of this operation will be the most adequate possible expression, humanly speaking, of the supreme cause of finality.

For instance, there is in human foresight a part that evidently belongs to the imperfection of the creature—namely, effort, groping, progressive and successive elaboration. We are not, then, to imagine the absolute as commencing by conceiving an end, then seeking means to realize it, then finding them, and putting them successively in operation. But is the idea of foresight bound to these accidents that are peculiar to human imperfection? We may apply to the attribute of the divine foresight what is habitually said of reasoning in God. Does God reason? No, it is said, if by that is meant that God seeks to prove to Himself a truth He did not know, and that He only discovers the truth step by step. But, on the other hand, if He sees all truths at a single glance, it is still the case that He sees them in their dependence and objective subordination. He sees the consequence in the principle, and distinct from the principle; but this is the essence of reasoning. It is the same with foresight. God sees all at one glance, but He sees the means as distinct from the end, and as being subordinate to it, and that is the essence of foresight. From the side of God there is thus only a single act: from the point of view of things there are two—namely, the act that perceives the end, and the act that distinguishes the means. Consequently, placing ourselves in the point of view of things, and by analogy with ourselves, we will call foresight the view of the end, as it suggests the creation of the means, or the view of the means, as it leads

to the realization of the end. Thus it is that, in the single act of the divine volition, theologians have been able to distinguish three distinct acts,—an *antecedent* volition, a *consequent* volition, and a *total* volition,—as mathematicians decompose a given force into hypothetical forces, of which it would be the result.

Thus the doctrine of the *Νοῦς*, or of intentional finality, has for us no other meaning than this, that intelligence is the highest and most approximate cause we can conceive of a world of order. All other causes, chance, laws of nature, blind force, instinct, as symbolic representations, are beneath the truth. If, however, it be maintained, with the Alexandrians, that the true cause is still beyond,—namely, beyond intelligence, beyond volition, beyond love,—this may be quite true, nay, we risk nothing in allowing that it is certain; for the words of human speech are all inferior to the essence of the absolute. But since this supreme and final reason is absolutely beyond our grasp, it is useless to speak of it; and we have only to do with the highest manner of conception we can attain. It is in this sense we say with Anaxagoras: *Νοῦς πάντα διεκόσμησε.*

CHAPTER IV.

THE PURE IDEA AND CREATIVE ACTIVITY.

WE have come to circumscribe the problem more and more narrowly; but still, the farther we advance, the more difficult becomes the solution, and the means of deciding become more difficult to manage. We have found that there is finality in nature; that this finality must have a cause; that this cause cannot be the mere mechanism which is destructive of all finality, nor what is above mechanism, instinct or vitality. It seems, therefore, that if the primary root of finality is neither matter nor life, it must be the soul,—that is, intelligence or thought; for there is nothing beyond, at least intelligible to us, except, perhaps, liberty. But liberty without intelligence and thought is only brute force, the *'Αναγκή* or the *Fatum* of the ancients; and as to intelligent liberty, it is precisely what we call by a single word, and for brevity, intelligence.

But is intelligence the same thing as thought? Or, if it be agreed to give the same meaning to these two names, is not the fact thus expressed double? Does it not contain two elements, the thing thought, and the thing thinking—the *τὸ cogitans*, and the *τὸ cogitatum?* If Descartes could say: *Cogito, ergo sum*, might he not have said as well: *Cogito, ergo est aliquid cogitatum?* Is not *the thing thought* an essential part of *thought?* When you say: A = A, is not there here an object distinct from the consciousness you have of it? And even if there were not an A in the world, is not this A that is in your thought distinct from the thinking subject, and opposed to it? Being *a thing thought*, it is not *that which thinks.* This objective element, immanent in intelligence, is

what is called the intelligible, the rational, and is logically anterior to intelligence; for there must be something intelligible, in order that there may be intelligence. The *truth* consists precisely in this intelligible in itself, and not in the consciousness we have of it. Let us call, with Plato and Hegel, this intelligible foundation of all reality, *idea;* let us call the internal and rational essence of things, *thought;* and we perceive that a new question may be raised—namely, what is the truly constituent element of thought? Is it the rational in itself, the intelligible, the idea? Is it, on the other hand, consciousness? In the first case, it is the objective of thought that is its substratum, and the subjective is no more than an accident, an accessory. In the second case, it is, on the contrary, consciousness that is the essential act of intelligence; it is it that renders possible the intelligible, that gives it life and being, that evokes it from nothing. For what is an intelligible that no one comprehends, a truth that no one knows?

From these two interpretations of the same fact may originate two hypotheses on the first cause of finality. While admitting by common consent that finality has its cause in thought, we may mean by this, either logical finality, that of the concept, of the pure idea (anterior to consciousness), or the finality of intelligence properly so called,—that is to say, conscious intelligence.

It is the first of these two doctrines that is the true foundation of the Hegelian philosophy, and which raises it far above materialist and purely naturalist doctrines, although the Left of this school has too quickly inclined to the side of naturalism.

Would not the true, the absolute type of finality, which is not in instinct, be found in the finality of the concept or the idea? In fact, every idea, every concept, contains, on the same ground as a work of art or a living being, an internal finality, a co-ordination of the parts to the whole. On this ground alone is it a concept, an idea. Suppose, in fact, that

the elements of which a concept is composed were only in juxtaposition and not united, you will have several concepts, and not merely one. Suppose they are in discord, you have a contradictory concept,—that is, a non-concept. Every concept is thus a conciliation between a certain multiplicity and a certain unity; and this is what Plato calls an idea (ἓν περὶ τὰ πολλά).[1] An absolute multiplicity would be unintelligible; an absolute and indistinct unity would be equally so. There must thus be a union of the two elements, and a graduated scale from the one to the other. 'The wise men of to-day,' says Plato, 'imperil *unity*, and *plurality* sooner or later, which they should not. From unity they pass all at once to infinity, and the intermediate numbers escape them.' These intermediate numbers—that is to say, the genera—are the proper objects of knowledge, and make of nature in general an intelligible whole.

Thus the whole world might be regarded as a bundle of concepts, like to what Leibnitz called the union of germs. On this hypothesis, each concept would itself be a bundle containing others, and so on without end to the absolute concept, which is the universal sphere of concepts; not that it is simply the sum and collection of them, but it contains them in substance in all its plenitude. But each concept amounts to an agreement of the parts with the whole, and, consequently, contains an immanent finality. This is what results even from the ideas most generally received on the origin of created finality. In fact, it is in general admitted, after Plato, that God created animals on pre-existing types present to His mind. But these types must already have presented the same relations of finality as their copies; otherwise it must be believed that the divine intelligence only contained outlines at first, which it afterwards perfected in becoming creative. The possible and the real are distinguished, and it is admitted that there must be a creator, in order that the possible may become real; but the possible itself is only such on condition

[1] *Rep.* lib. x. p. 596.

of already containing intrinsic relations of accommodation. No doubt concepts may be combined, and this is secondary or finite finality; but this combination itself supposes pre-existing concepts, in which the agreement of the parts with the whole is already given, and is not the work of a voluntary accommodation. If it be so in the idea, why should it not be the same in the realization of the idea? Or, rather, is there veritably a difference between the idea and the reality, between the model and the copy? If the idea is logically anterior to consciousness, it has already a mode of existence in itself anterior to the fact of being known. But what is this mode of existence? And who can prove to us that it is anything else than just what we call existence? Are things distinct from their ideas? Whereby and wherein are they distinct? We transfer our subjective ideas to the divine intelligence; we suppose that God may know possible things that are not real, which is only true of the finite intelligence. But in the absolute, to be thought and to be are only one and the same thing. Being is the intelligible, and the intelligible is being. There are not two men, man in himself and the real man; otherwise, as Aristotle says, a third would be needed to set them in harmony. To admit ideas distinct from things (or, what is equivalent, things distinct from ideas) is, as Aristotle says, to count twice the same beings, adding the words *in themselves* (*καθ' αὑτά*). Will it be said that things cannot be confounded with their ideas, because they are finite, contingent, and imperfect, and the world of ideas is only the world of the perfect and absolute? Why, this would just be to deny that things have their ideas, their eternal and pre-existing models. If things have their ideas, these ideas represent them with their characters of contingency, limitation, and imperfection. Thus the plant in itself is represented as less perfect than the animal, the animal as less perfect than man. These, being changing things, are represented as changing, and their ideas contain the idea of change. What makes us believe that the totality of things consti-

tuting the world is finite, is that we ourselves are one of these things, and that we only consider the whole from our limited point of view. But these limitations are only logical and relative, and the entire sphere of concepts is nevertheless an absolute sphere. Besides, has not Plato admirably shown that the not-being itself has its place among ideas? Without the not-being there were no distinction; all the genera would be confounded, thought would vanish with being.[1]

For the rest, we know that the question how far the idea is distinct from nature, is one of those that have divided the Hegelian school. Hegel maintains this distinction, which vanishes with his disciples. What with him is *ideal* becomes with them *natural*. But even if one maintained, with Hegel, the distinction of the idea and nature, of the abstract and the concrete existence of the idea, one might still say that nature is only the idea in motion, the idea externalized, and, consequently, that it must manifest externally the internal finality that constitutes it. Nature being only the idea, each of the terms of nature is only one of the terms of the idea. It is, therefore, a concept; and as the concept has an internal finality, the being that represents it has the same finality. It is only the concept realizing itself, the essence seeking and finding itself by degrees; but as the final end of each being is to attain all its essence, its whole idea, it is, therefore, definitively the end that realizes itself. What is the end of the animal? It is to live. But is it to live like the plant? No; as an animal. But is it merely to live like an animal in general? No; but as a given animal in particular. The end of each being is thus to live conformably to its own nature; it is its nature that is its end. And as, at the same time, this proper nature or essence is the cause of its development, the end is thus the cause. Here is the very essence

[1] It might be said that there is a distinction between things and ideas—namely, that things move, while ideas do not move. But if the doctrine of Kant be admitted on the subjectivity of the idea of time, this distinction would disappear. Motion would be a purely ideal fact, having reference only to our mode of conception.

of the final cause, the absolute identity of the end and the cause. It is because it is an animal, and such an animal, that it develops in such a direction, and it is in order to become that that it develops. Thus the *in order to* blends with the *because*. But both are confounded in the concept of the being. It is the concept of the bird that makes it have wings, and it has wings in order to realize the concept of the bird.

In a word, whoever admits the theory of Platonic *archetypes*. (τὰ παραδείγματα), must acknowledge that in this ideal world, that serves as model to the real, each type contains as pure essence and *à priori*, and without having previously been fabricated, the same relations of accommodation as, in the real world, the genera really existing. But since this accommodation may exist in itself before creation, without it being necessary to suppose an anterior cause, except the Absolute, that envelops all, and of which ideas are only the modes, why should these same types need for their realization another virtue than the virtue that gives them being,—that is to say, their own essence, and their relation to the Absolute? In this conception, finality is not the result of chance; there is no chance. It is not the result of mechanism, mechanism only being the totality of inferior notions, the poorest of all, and, consequently, the least intelligible. It is not the result of vitality and instinct; for vitality and instinct are precisely the facts of finality that must be explained. Finality has its cause in thought,—that is to say, in the necessity of things being rational in order to exist. Finality is the truth which, in the common opinion, is bound to the consciousness one has of it, while it is independent of it. Hegel has expressed this in one of his finest pages, that sums up all his doctrine.

'When I *know* how a thing is, I possess the truth. It is thus one conceives the truth at first. But that is only the truth in its relation to consciousness, or *formal* truth, mere justness of thought. The truth, in a profounder sense, consists, on the other hand, in the identity of the object with the notion. This is the truth we mean, for instance when we

speak of a *veritable* state, of a *veritable* work of art. These objects are true when they are what they ought to be,—that is, when their reality corresponds to their notion. Thus viewed, the false (*das Unwahre*) is the *bad*. A bad man is a false man, a man who is not conformed to his notion. In general, nothing can exist in which this agreement of notion and reality is not found. The bad and the false themselves are only in so far as, and in the measure in which, their reality corresponds to its notion. The absolutely bad and the absolutely contrary to the notion fall and vanish, so to say, of themselves. The notion alone is that by which things exist, which religion expresses by saying that things are what they are by the Divine Thought that created and animates them. When we start from the idea, it need not be conceived as something inaccessible, and as placed beyond the limits of a region that cannot be reached. For it is, on the contrary, what is most present, and is found in every consciousness, although it be not there in its purity and clearness. We conceive the world as an immense whole that God has created, and that He has created because He finds His satisfaction in it. We also conceive it as ruled by Divine Providence. That is to say, the beings and multiplied events that compose the world are eternally reduced to that unity from which they proceeded, and preserved in a state conformable to that unity. Philosophy has no other object than the speculative knowledge of the idea, and all research deserving the name of philosophy has only proposed to manifest in the consciousness this absolute truth, which the understanding only grasps in some sort by fragments.'[1]

The grandeur of the conception we have just set forth will not be disputed. It leaves far behind it all the materialist hypotheses, and even those of hylozoism, themselves so superior to materialism. It is not very certain that Plato himself, in his theory of ideas, had any other conception than that. Although its pantheistic character cannot be mistaken,

[1] Hegel, *Grande Encyclopédie*, § 213.

it is yet distinguishable from Spinoza's hypothesis in two essential points: 1st, It reduces to the *idea* what Spinoza calls *substance*. The characteristic and determining element of the being is the rational, the intelligible, the logical; while for Spinoza it is the *substratum*, which is hardly distinguishable from the Aristotelian matter, and has no title to be called God. 2d, The idea is considered as a circle, which returns to itself: it sets out from and returns to itself. It is, therefore, final cause; while Spinoza's substance is lost in its attributes, the attributes in their modes, so that the being seems always removed farther and farther from itself. The substance is thus only the efficient cause, and its progress is only downwards, its development is one-sided; while, in the philosophy of Hegel, the advance of the idea is progressive, and the motion is double, at once centrifugal and centripetal. The idea is the fusion of the two forces. The conception of Hegel is thus more spiritualistic; that of Spinoza more materialistic. Let us now see on what conditions the Hegelian conception will maintain its superiority over that of Spinoza, and whether it will not be just by reducing itself to the spiritualist conception properly so called.

The essential conception of Hegelianism is to substitute *ideas* for things, to eliminate the thing (*das Ding*) as a *caput mortuum*, void of all content. A thing only is, and deserves to be, as it is intelligible and rational. Each thing possesses as much being as it has rational content. A heap of stones is only a being by accident, because the stones composing it have only extrinsic and fortuitous relations, and have nothing intelligible. If this conception, which is true, is admitted, it must follow that the being existing because of intelligibility, the absolute must be the absolutely intelligible. But what is an intelligible, but what is capable of being comprehended? What is the rational, but what satisfies the reason? What is the truth, but what is seen and recognised as true? What is a truth that no one knows, and that does not know itself? A truth absolutely unknown, which, on the one hand,

does not rest on a substance, and, on the other, is not received in a mind, is nothing but a mere possibility. Bossuet has admirably said, in a famous passage which contains the marrow of what is excellent in Hegelianism: 'If I now ask where and in what subject these truths subsist, eternal and immutable as they are, I am obliged to own a being wherein truth eternally subsists and is always understood; and this being must be the truth itself, and must be all truth; and from it the truth is derived in all that is, and is understood apart from it.'

Thus a truth not understood is not a truth. Hegel says that the truth in its relation to consciousness is only a 'formal truth.' We, on the other hand, say that a truth without any relation to consciousness is only a formal truth, —that is, a potential truth. No doubt, if we speak of the human consciousness, subjective, particular, localized, the perception of that truth will only constitute, if you will, a formal truth. For the truth in itself, to be perceived by man, will only be an *external denomination*, as the names we give Him are to God, which can add nothing to His perfection. It by no means follows from this that consciousness does not form an integral part of truth. Only to an absolute truth there should be an absolute consciousness to correspond; the subjective element ought to be adequate to the objective. Hegel himself does not hesitate to define the idea, 'the identity of the subject and the object;' and he accuses the philosophy of Schelling of having too much sacrificed the subject to the object. But what can remain of the subject if knowledge, consciousness, be taken from it? The truth can, therefore, only cease to be formal, by being the adequate act of the intelligible and of intelligence, as Aristotle has defined it: it is the thought of the thought. For the rest, this is what Hegel himself expresses in this proposition, which is the conclusion of his *Logic*: 'The idea, as unity of the objective and subjective idea, is the notion of the idea that has no other object than the idea, or, what amounts to the same thing, which takes itself for its object.

It is the idea that thinks itself.'[1] Fenelon expresses the same thought more clearly when he says: 'It is thus evident that He [God] knows Himself, and that He knows Himself perfectly,—that is to say, that in seeing Himself, He equals by His intelligence His intelligibility; in a word, He comprehends Himself.'[2]

We perceive from this analysis that the Hegelian conception, properly understood, does not essentially differ from that which we propose. In fact, between an idea that thinks itself and an intelligence that thinks the truth, and makes but one with it, the difference would be difficult to grasp. We may indifferently, and according to the point of view selected, give prominence to the rational and objective side of the idea, and we shall have the impersonal God; or give prominence to the subjective and conscious point of view, and we shall have the personal God. But these two points of view make but one; and in both systems intelligence, the *Νοῦς*, will be at the origin of things. It is in this sense that the identity of being and thought may be admitted.

The absolute idea being thus at the same time absolute intelligence, how shall one conceive the ulterior development of other ideas? For it is this development that constitutes the world properly so called, or nature.

The question is this: Given the world as the external development of the absolute idea (whatever for the rest may be the cause of this externalization—to Hegel as to us an insoluble problem), the question is whether this development has its cause in the idea considered only in the objective and rational point of view, or in the idea considered in its totality, as the unity of subject and object. In the first case, the world will only be the impersonal development of the divine idea; there is nothing like intentionality, foresight, wisdom. The idea realizes itself by its intrinsic virtue; finality is only logical. But if the world is derived from the idea considered altogether (that is to say, subject-object), it may be affirmed quite as well that it is derived from the subject idea as from

[1] *Logic*, § ccxxvi. [2] Fenelon, *Exist. de Dieu*, 2me part. art. v.

the object idea,—that is to say, from intelligence as from being,—and it will be free to us to say, as in the common philosophy, that intelligence has made the world. Therefore, finality is intentional, for intelligence, having made the world conformably to the idea which is itself, knowing the end, knows at the same time all the steps that conduct to the end; and this relation of subordinate knowledge to the final and total knowledge is what we call, in human language, foresight and intention—in a word, wisdom.

Let us consider the matter on another side, so as to effect the complete transformation of the pure idea into creative activity.

It is, doubtless, with reason that Hegel has set forth the rational character of being, and advanced this proposition, that what is not rational is not real; but the rational as such, taken in the precision of its idea, is something inert, dead, immoveable, from which no action can proceed. Aristotle had made this objection to the ideas of Plato, but without reason; for Plato attributed *a force to ideas*, δύναμις. He ascribed to them intelligence, life, and motion, and placed in Jupiter a royal soul (βασιλικὴν ψύχην). Without force, soul, or activity, the idea not only could not be developed, it could not even *be*. Existence is not a mere rationality, a simple concept. It is, as Herbart says, 'an absolute position.' Being is because it is. It supposes itself. But this act of supposing itself is of another nature (taken strictly) than rationality. Granting that the idea supposes itself, and, in doing so, supposes the rest, still, in so far as it supposes itself, it is activity and not pure idea; and as we have seen that the idea itself is at once intelligence and truth, it is thus an intelligent activity. But an intelligent activity is nothing else than a will. The pure idea is thus a pure will, an absolute will.

What essentially constitutes finality, is that the relation of the parts to the whole is contingent: it is just this that is finality. If, in fact, it be admitted that matter, obeying necessary laws, ought by force to take the form of an organ fit for a certain function, the idea of finality must be

sacrificed, and only blind necessity be admitted. But when we speak of an end, it is implied thereby that there is something that limits and circumscribes the mode of action of matter to determine it to a certain effect rather than another. This relation is, therefore, contingent, or, yet once more, there is no finality, which is no more in question. Meanwhile this relation of contingency remains always the same, whether as regards real matter or an ideal matter conceived *à priori*. Ideal matter is no more subject than real matter to a necessary law, determining it to become bird, mammifer, or man. It contains, no doubt, these forms potentially, for, in fact, it realizes them; but this bare power does not suffice to produce these combinations, and to no purpose are they logically possible,—that is, do not imply a contradiction; they are impossible really because one of the elements of their possibility is precisely something that is not mere matter. Thus ideal matter, distinct or not from real matter, so far as it realizes relations of finality, has not its reason in itself. Ideally, as well as really, it only expresses a mere possibility, a subject of motions and indeterminate figures, but not of precise combinations or appropriated forms. In a word, no more can be said of the concept than of things; and if, in things themselves, the predetermination of the present by the future cannot have its cause or reason in the material substratum, in the ὕλη of Aristotle, it is quite the same with the concept. The concept of matter does not contain more adaptation to an end than matter itself; in both cases the true cause must be beyond. If, then, there is a pure concept of the animal in itself, that concept cannot exist by itself. So far as it contains an ideal adaptation of matter to ends, it has in it something contingent, which can only be explained by a will directed towards an end.

It will be said that if the concept of matter does not oppose the formation of certain determinate bodies,—the elements, for instance,—it is not evident why it should be opposed to more complicated bodies. We will ask, in our

turn, if even these first bodies are necessarily contained in the concept of matter, and if the idea of a substance which is only by hypothesis endued with motion can, strictly speaking, lead to the concept of anything determinate.

If, then, real matter does not guarantee us any order, the idea of matter does so no more; and inversely, if the idea of matter could give birth of itself to all other ideas,—that is to say, to all that presents an order, plan, form, or finality,—it is not evident why it should not be the same with real matter, and not merely with ideal matter. The pure idea is of no further use. But if, in fine, it is said that it is not the concept of matter that engenders determinate forms, but that it is the idea of nature altogether, the idea of the whole, which envelops and conditions all its parts,—the concept of matter being itself only the poorest and lowest of all,—I shall willingly admit this thought; but I still inquire, In virtue of what does the absolute idea accommodate the poorest and lowest concepts to the interest of the most elevated, when no relation of necessity exists between the one and the others? and what other way can there be of conceiving this accommodation, essentially contingent as we have seen it, if not by something which can only be called by the name of choice?

Will it still be said that necessity, no doubt, is not applicable to the concept of finality, as regards starting from the lowest notions to reach the highest, but, on the other hand, that it is the highest notions that necessarily engender their material conditions? that thus there may be at once finality and necessity, and, consequently, that it is useless to appeal to choice, foresight, intentionality? For example, as the notion of the circle implies the notion of radii and renders it necessary, as the concept of ten implies the concept of units, the latter the concept of fractions, and so on, so the concept of the animal would imply that of organs, the concept of the vertebrate that of a circulatory system. Thus a necessary and absolute synthesis would be established in an inverse direction to the impotent analysis of materialism, without the

very slightest need to appeal to a previous consciousness of the synthesis, and above all a choice and will, as having co-ordinated all the rest. There is co-ordination, there is order: order is even the essence of things; but this order has nothing contingent, and is sufficiently explained as logical necessity and impersonal truth.

We reply that, whether the series be begun above or below, either the idea of finality must be renounced, or the idea of logical necessity. It is as impossible to comprehend that an end necessarily produces its conditions, as to comprehend that the conditions by inevitable destiny conduct to the end. To say that the function creates the organ, is not more intelligible than to say, the organ creates the function. That the idea of sight, for instance, is capable of commanding matter, of organizing it under the form of an eye; that the idea of life is capable of engendering organs of nutrition, is always absolutely unintelligible: it is to revert to the doctrine of occult qualities and of instinctive finality. In the concept, just as in reality, the end cannot be active of itself; the end cannot be the same thing as what realizes the end. If it be said that glory made Alexander the conqueror of Asia, it is meant that the love and thought of glory—that is, the previous imagination of the result of his actions—determined Alexander. But it is with the logical concept as with the reality. In the concept of the eye, as well as in the real eye, sight has no necessary logical relation to matter, and, consequently, cannot predetermine it to become an eye.

Thus it is evident that the logical concept can no more explain finality than mechanism or instinct have done; or, at least, it only explains it if we change the logical into an intellectual concept,—that is to say, if we add to it the intelligence that changes the conditions into means, and for which the results are ends.

But we acknowledge that this whole deduction supposes that the Platonic *exemplarism* be renounced, which supposes beforehand all the concepts of things, including their finality,

to be given in the divine intelligence *à priori*, which thereby removes them from the choice and action of God, and which destroys from the foundation the argument of final causes. According to this hypothesis there would be, in fact, in the divine intelligence, types eternal and absolute, like God Himself, in imitation of which He would have created the contingent and limited beings composing the universe. Every class of beings would have its model, its *idea*. The divine intelligence would contain from all eternity an ideal exemplar of the world; and not only of this actual world, but, according to Leibnitz, of all possible worlds, among which God would have chosen this as the best of all. Not only genera and species, but individuals themselves, would be eternally represented in God. Thus the world would exist under two forms: 1st, Under an ideal form in the divine nature; 2d, Under a concrete and real form outside of God.

Such a hypothesis evidently destroys all foresight and creative wisdom in the Supreme Being. For all things being represented beforehand, from all eternity, as they behoved to be, their finality thus equally exists in a necessary and eternal manner, without God intervening otherwise than to contemplate it. Let the divine idea, for instance, conceive the human body. In this idea are found represented all the relations that constitute the body, and, in particular, the relations of adaptation and of finality, without which there is no human body. Such an idea, being eternal, absolute, like God Himself, is not created by Him; it is not the product of His will nor of His power, for it is Himself. Must it not, therefore, be concluded that there may be relations of finality self-existing, before any foresight, and independent of any creation and of any personal combination. If foresight or choice is not in conception, no more is it in creation itself. In fact, when God wished to create the body, what had He to foresee and to combine, since all is foreseen and combined beforehand in His eternal thought, in the eternal model that rests in Him? He had nothing to do but to copy that eternal model, without

having need of any particular act of thought to adapt means to ends. This adaptation is given in itself by the very nature of things, in the divine idea of a human body; and unless it be said there is no such idea, it is not evident in what creative labour consists; I can only see in it imitation pure and simple.

No doubt if we suppose, like Plato, matter existing apart from God, already having determinate properties, I would admit that there was room for combination, comparison, and foresight, to adapt the laws and properties of this matter to an ideal plan; but as such matter does not exist, and, consequently, opposes no obstacle to God, He has no difficulty to foresee nor to remove, no means to prepare; the world is given Him *à priori*, entire in all its parts, in its totality, in all its order. He has only a word to say, a *fiat* to pronounce. In this I see great power, but no act of foresight.

.Thus, on the hypothesis of *exemplarism*, or of Platonic *paradigms*, foresight would have no place in God. It would not be in the conception of the types, since they are eternally present to Him (*αὐτα καθ' αὐτα*), holding of Him their essence, no doubt, but necessarily; it would not be in the execution of the work, since God would have nothing else to do than to execute what He had conceived. It is said in the schools that God is the author 'of existences and not of essences.' But if it be so, as Gassendi said with reason to Descartes, 'What great thing, then, does God do when He produces existence? *Certainly He does nothing more than a tailor, when he clothes a man with his apparel.*'[1]

Reid makes similar objections to the theory of *ideas*, or eternal essences. 'This system only leaves the Creator, in the production of the universe, *the sole merit of execution.* The model had all the beauty and perfection that is admired in the copy, and the Deity had only to copy after a pattern that existed independent of Him. . . . 2d, If the world of ideas, without being the work of a perfectly wise and good intelligent being, could have so much beauty and perfection,

[1] *Objections to the Fifth Meditation.*

how can we infer from the order and beauty of this world, which is but an imperfect copy of the other, that it must have been made by a perfectly wise and good being? Either this argument is destroyed by the supposition of an ideal world that exists without cause, or else it applies to that ideal world itself.' [1]

On the hypothesis of *exemplarism*, God would show in creating less invention and genius than the most commonplace of artists. The latter, in fact, as esthetic teaches us, has not only the merit of copying his model, but he creates one for himself, which he externally realizes. As to God, He would do nothing but slavishly copy the eternal model that He carries in Himself! Where would be omnipotence in an act so inferior? He creates, it is said, the material of things, and it is herein that His is superior to human art; but what is this matter compared with the form? Would he who should create marble be superior to him who creates the statue? Thus the dignity of the Creator appears to us much reduced, when no other honour is left to Him but to produce the substance of the world, while the world itself, in its harmonious and wise form, would be eternally represented *à priori* in His mind, without Him having in any way ordained it Himself and by a free volition.

Observe that on this hypothesis it is not merely the general essences that are thus represented in the divine understanding, but also individual essences. Not only man in himself, but Socrates in himself, Plato, Adam, and so on, are eternally represented there with their specific and individual characters; and the whole series of actions that each of them must accomplish, all the consequences, the whole chain of events, all is *à priori* in the divine mind. When God creates, He therefore does nothing but externally produce that ideal world --that photograph, by anticipation, of the real world. But is not this, as the opponents of optimism have so often objected, to subject God to fate,—to associate with Him, even as ideal,

[1] *Essays on the Intellectual Powers*, vol. i., Essay iv. chap. ii. p. 371.

a world, or even worlds without end, with which He dwells, without having willed it?

If, then, we wish to maintain the theory of final causes, it is indispensable to push it farther, and to transfer it into the heart of the divine nature—to the very production of the divine types. Creation must be made to commence before the realized appearance of the world, its first lineaments must be discovered in the divine life itself.

We will admit, then, a sort of primary creation anterior to the creation of the world, and which we would willingly call the *ideal creation.* God, before creating the world, creates the *idea* of the world; He creates what Plato calls the *αὐτόζωον* or the *παράδειγμα*—namely, the ideal type that contains in it all the genera, species, and individuals of which the sensible or real world is composed.

But to say that God creates essences at the same time as existences, is this not saying, with Descartes, that God is the author of the eternal verities, that He creates the true and the false, good and evil?—a theory a hundred times refuted, and which in itself is indefensible; for, on the one hand, it makes of God a very tyrant, and, on the other, it puts in peril all certitude and all truth.

We must here establish a distinction between verities and essences. No doubt the truth—that is to say, the logical connection of ideas—cannot be the object of a free act of God, nor of any power in the world. No doubt, given a triangle, its three angles must necessarily be equal to two right angles. But is it necessary that a triangle be given? That is the question. A triangle is the synthesis of three lines arranged in a certain manner. But is this synthesis necessary, eternal, absolute, like God Himself? Must not there be a certain voluntary act to bring these three lines together, so as to intersect? As for man, it may be said that the idea of the triangle, and of geometrical figures in general, is inevitably imposed upon him, whether because he meets them in nature or because he sees them in the divine mind. But in God

why should there be supposed of necessity a representation *à priori* of what does not yet exist? What contradiction is there in admitting that God, by a free act, produces the idea of the triangle, which, being once given, carries with it all that is contained in its essence? God, on this hypothesis, does not create the truth, but He creates what, being once given, will be, for the mind that contemplates it, the occasion of discovering a crowd of truths. But these truths would not have existed if the idea that contains and envelops them had not been conceived.

It is the same with organic forms as with geometric. As soon as we suppose them given, there immediately follows a certain number of necessary truths, which would not exist if these forms were not given. For instance, given an animal, it is necessary for it to have means of nutrition and reproduction; and a certain mode of nutrition being given, certain organs are necessary. Cuvier has clearly proved that there was an anatomy *à priori* that could be constructed from this or that datum. But what does not seem necessary is that the idea of the animal should be given. Why should there be supposed an eternal animal, the absolute type of all existing animals? Would not that be an animal-God, if we may so speak? In order that this idea of the animal may exist, there must be an activity that makes the synthesis of all the elements of which the idea of the animal consists, and that distributes them conformably to a plan. No doubt it is not by chance and caprice that God creates such a combination, and even it has its laws. But I mean to say that if the creative activity did not exist, no more would such types exist. What I criticise is the conception of a God condemned to contemplate images of which the real examples nowhere exist. To my thinking, these models or essences must have their origin and causality in the divine power and will as well as existences.

To make this point of view more clearly understood, let us notice that in intelligence, as experience gives it to us, two

things may be distinguished,—contemplation and creation. There is *contemplative* intelligence and *creative* intelligence. When we learn a science, as geometry, algebra, etc., our intelligence does nothing but recognise and contemplate the presented truth, and it is still the same when we think of the truths we have once discovered. They are now for us only an object of contemplation. No doubt that is not a purely passive state of the mind, and Aristotle was right to consider contemplation as an activity. But is it the highest of activities? Is there not above it the creative activity,—that of the poet, the artist, the savant even? Here intelligence is not content to contemplate what exists; it produces itself what did not exist before. Molière creates the type of the *Misanthrope*, Shakespeare that of *Hamlet*. Where had they seen those types? Nowhere, or at least nowhere entirely. It is the poet himself that has given birth to these forms and types; he has combined their elements into a harmonious and living whole; so do the sculptor, painter, and architect. Where was St. Peter's at Rome before Michael-Angelo? He caused it to spring from his thought; and although the myth of Jupiter taking Minerva from his brain has been a thousand times mentioned, it becomes for us here more than a common metaphor—even the vivid and exact expression of the theory we maintain. In the genius of the savant it seems that the two modes of intelligence unite; for, on the one hand, there is for him the contemplation of a truth he has not made, and, on the other, by his discovery, there is a creation of means by which he forces the truth to reveal itself; and the more creation there is, there is the more genius.

In pure contemplation, the intelligence derives nothing from its own self; it is only a mirror reflecting an object superior to it. And even if it be admitted, with Leibnitz, that pure knowledge is innate, or, with Plato, that the soul does nothing but remember, it is still the case that in knowledge acquired, if there be spontaneous evolution, that evolution has nothing personal, nothing that the soul could consider as its individual

work. It is not so in discovery, or in poetic and artistic production. In both these cases the soul not only has thoughts; it *makes* them. There is an internal elaboration and a fertilizing activity that can only be explained by the word creation.

So, too, the epithet 'creative genius' is well applied to those who have introduced new types, methods, or truths into the world.

The difference will now be understood that we make out between contemplation and creation; and who can deny that the second of these terms is superior to the other? This superiority is sufficiently attested by the different amount of pleasure procured by the two acts.

To enjoy a truth is evidently not so sweet as to enjoy the conquest of truth; to contemplate beautiful works of art cannot equal the pleasure of creating them; the pleasure of a virtue practised is nothing compared to the pleasure caused by a triumph over actual temptation; and, in general, productive activity is superior to mere contemplation.

When Aristotle considered contemplation as the highest of activities, he compared it to material activity that produces outside; but, in what he called contemplation, he did not pay attention to the difference we have mentioned. He did not observe that in pure intelligence there may still be two modes of activity—the one creative, the other purely contemplative, and, therefore, more passive. He only thought of the infinite pleasure that the discovery of truth procured him; and he did not perceive that even this discovery was not purely contemplative, but that there was on his part a display of inventive activity, and that it was in that very thing that his happiness consisted.

Those who have said that the search for truth is worth more than the possession of truth itself have had a presentiment of the thought we express. But they deceived themselves nevertheless: it is not the search, but the discovery that is the supreme pleasure. For to seek without finding

has never been a pleasure. No more is it when the artist is painfully seeking his theme that he is happy; it is when he has brought it forth. What is true is, that for the scientist discovery, and for the artist production, are the supreme happiness; but, the truth once found and the masterpiece achieved, they both pass on to other discoveries, to other thoughts.

It will now be understood what we call in God ideal creation. It is in Him an analogous act (save the difference of infinitude) to what we call the creative act in human genius.[1]

We therefore conceive two periods in the divine life, whether historically or logically distinct does not here much concern us. In the first period, God is in Himself collected, concentrated, gathered in Himself in His indivisible unity. This unity is not an empty and bare unity, whence all proceeds without one knowing why (for, being nothing in itself, it would have no reason to determine itself in one direction rather than another); it is an active and living unity; it is the absolute determination, the absolute concentration of being; it is the *plenum.*

God being thus conceived as the absolute unity, act, and consciousness, creation commences when God comes out of Himself, and thinks something else than Himself. But this very thing is creation. There would thus be in some sort two creations,—the one concrete, historical, in time and space, composed of individualities that have their proper being, and are distinct from their Creator, at least in that superior state in which they become self-conscious; and another creation, which I call ideal, and which consists in the very invention of this world, which may be considered as conceived before being externally produced. If we call this world the *word* of God, the divine *logos,* we shall thus distinguish, with the

[1] For the rest, Plato himself is not far from this thought (see *Rep.* lib. x., *the idea of the bed*): 'There are thus three species of beds—one which exists in itself (ἐν τῇ φύσει), and of which it may be said that God has made it, ἣν φαῖμεν ἂν θεὸν ἐργασάσθαι.'

Alexandrians and Philo, two kinds of word or logos—the *internal* and the *manifested* word: λογός ενδιάθετος, λογός προφορικὸς. There will thus always be an ideal and a real world, a *paradigm* and a *copy.* But, properly speaking, these are purely logical distinctions, borrowed from the mode of action of the human intelligence, for which thinking and doing are two things. This duality is useless when applied to the creative activity. To invent and create are one and the same thing. The two creations thus blend into one. But then we know the meaning of the expressions, wisdom, art, science, applied to the works of creation. God is no longer a copyist, faithfully reproducing a fixed model; He is not a magician, who, by an act of will, evokes spirits pre-existing in a supramundane world. He is a true creator, who knows, who can, and who wills, all together; who wills at once the end and the means,—the end by an antecedent, the means by a consequent volition,—that is to say, in reality, by a unique and absolute volition, which we logically analyze to bring it down to our understanding.

Thus, as we said above,[1] the type of creative activity is not mechanical industry, although it is from this datum that we set out to rise to the idea of divine art, and although there is even here a mode of action much superior to mechanical instinct. No more is it a calculating intelligence obliged hurtfully to combine means to reach its end. It is creative genius, in which is contained the faculty of combining and foreseeing, while at the same time it is absorbed by a higher power; it is the point where intelligence is united to feeling and will in an indissoluble union. Such is the *commentary,* the most finished *monogram* that nature could offer us of divine wisdom; but let us not forget it is only a commentary. Our knowledge of the first cause, as all the great theologians have thought, is only *analogical,* and not *ontological.* God alone knows Himself as He is; we can only know Him in relation to us.

It would, moreover, be to deceive ourselves, and wrongly to

[1] See Book ii. chap. iii.

think that what is necessarily relative in our knowledge of God had been set aside, to seek to imagine something more than intelligence, by saying, for instance, that God is liberty, that He is love, etc. That would, in fact, be saying nothing more than what we say. No doubt, God is absolute liberty; but a liberty without intelligence is no liberty: it is caprice, or rather fate and chance. No doubt, God is love; but a love without light is no love, and may do more harm than good. Thus He is enlightened liberty and love; in a word, He is wisdom, as well as power and love. But it is, above all, as wisdom that He appears to us in creation, and thereby it is, above all, that our reason can find some way to Him. For although the world, by its immensity and infinity, proclaims an infinite power, such a power is not more the attribute of God than of His opposite. No doubt the world affords us proofs of goodness, or, at least, there are many good things in the universe; but there are also many bad things, and we know that a blind power might produce by chance both good and evil, as water is a benefit to him who is thirsty and a plague to him whom it inundates. But what a blind power cannot simulate are wise and industrious works, made with art. The apparent disorders that may be found mingled with these wise works prove nothing against them, for it is not here as with goodness. One may be good by chance; one cannot be wise by chance. We can understand that an apparent disorder is accidentally met with in a work of wisdom, but not that a wise combination, and even a thousand million wise combinations, are accidentally shown in a blind production.

Some philosophers of these last times, who combine with extreme subtlety sentimental tendencies, have, above all, characterised the nature of God by love, and seem to have disdained wisdom as too vulgar an attribute. It seems it was no very great affair to know how to make a fly's wing; and, as proof of final causes, they will mention attraction, aspiration, tendency, love—rarely art, artifice, skill, know-

ledge. But attractions and tendencies may be reconciled with the idea of a blind and dissolute force, which casts away its surplus, and diffuses at once life and death. Such facts do not prove more in favour of Providence than its opposite. The art of nature, on the other hand, is a 'brilliant and prerogative' fact, as Bacon says, in presence of which all theories of fortuitous combinations and of blind instinct will always be shipwrecked. It is also a fact from which one cannot escape by indifference, by forgetting the problem, by a sort of design of not receiving. One may cease to ask whether the world is finite or infinite, if it has had a beginning or will have an end; for nothing obliges us to put these questions to ourselves. But one will never see a flower, a bird, or a human organism without experiencing a wonder that Spinoza rightly calls 'stupid,' for it amounts to stupefaction. Finality is in some sort the only *idea* that is necessarily implicated in experience. I can consult experience without thinking of the absolute; I can see things beside others without thinking of infinite space; I can neglect causality as an active power, and replace it by the relation of the antecedent to the consequent, or by the generalization of phenomena. But how can I see an eye without thinking that it is made *in order to* see, so far, at least, as I think as a man, and not as a systematic philosopher? The *in order to*, however, does not occur to the senses, is not a phenomenon of experience. It is an idea, only an idea; but an idea so bound to experience that it seems to make but one with it. What is vulgar in the idea of finality is precisely what constitutes its high metaphysical value. For the more that metaphysic connects itself with the common reason, the more chance has it of being a solid and necessary science. The more it rarifies its conceptions, the more ground will it give for believing that they are only the artificial creations of an overwrought brain.

This is why we have specially given ourselves in this whole book to analyze and interpret the idea of combination, which at all times has been what most struck the vulgar. It is

combination—that is to say, the rencounter of a very great number of heterogeneous elements in a single and determinate effect—that is the decisive reason of finality. The agreement and proportion existing between such a rencounter and such an effect would be a mere coincidence (that is, an effect without a cause) if the effect to be reached were not itself the cause of the combination. Mechanism, in explaining the production of each effect by its own cause, does not explain the production of an effect by the *rencounter* and *agreement* of causes. It is thus condemned, whatever effort it may make to dissemble such nonsense, to explain the universe by the fortuitous,—that is, by chance. Fortunate rencounters, favourable circumstances, unforeseen coincidences must be multiplied without end, and continually increase in number, as the universe passes from one degree to another, from one order of phenomena to another. Is it sought to explain this faculty of combination which nature possesses, and which is like that of the industrious animals and the innate art of insects, by an analogous cause,—that is to say, by a sort of instinct,—nature proceeding to its end, like the animal itself, without knowing and without willing it, by an innate tendency? In admitting such a hypothesis, we should do nothing but state the very fact of combination, while assigning to it some unknown cause, called instinct, by analogy, but which would tell nothing more than the fact to be explained—namely, that nature goes towards ends. The only way in which we could conceive an end is to view it as a predetermined effect. But how can an effect be predetermined except so far as it is designed beforehand, and preconceived in the efficient cause called to produce it? And can this preconception or predestination be for us anything but the idea of the effect? And, in fine, what can an idea be but an intellectual act, present to a mind in a consciousness?

Take away consciousness from an intellectual act, and what will remain but an empty dead concept, a potential concept? Take away this concept itself from the efficient cause, and

what will remain but an indeterminate tendency, which nothing will lead towards one effect rather than another? Take away even this tendency, and what will remain? Nothing — at least, nothing that can serve to connect the present with the future; nothing that can explain the rencounter of causes with the effect. This rencounter being the problem to be solved, the knot to untie, even the hypothesis of tendency (*ὁρμή, ὄρεξις*) establishes a certain intermediary between cause and effect; the hypothesis of the concept (*λόγος σπερματικὸς*) adds to it a new intermediary; the conscious concept (*νόησις νοησήως*), such is the third degree, such is the true link of cause and effect. There the range of our vision stops; beyond begins the region of the *Unknowable*, which the Gnostics admirably called the Abyss and Silence. We too keenly feel the limits of our reason to make our own conceptions the measure of the Absolute Being; but we have too much confidence in His veracity and goodness not to believe that human conceptions have a legitimate and necessary relation to things as they are in themselves. If, then, we have been able suitably to use our reason, if we have obeyed as strictly as possible the severe rules of the philosophic method, we are entitled to believe that the highest hypothesis that the human mind can form regarding the supreme cause of the universe would not be contradicted, but rather would be confirmed and cleared of its obscurities, if it were given to us, as the theologians say, to see God face to face by a direct and immediate vision. Such a hypothesis may well be but an approximation to the truth, and a human representation of the divine nature; but although inadequate to its object, it does not follow that it is unfaithful to it. It is its projection into a finite consciousness, its translation into the language of men, which is all that philosophy can demand.

CHAPTER V.

THE SUPREME END OF NATURE.

THE doctrine of final causes cannot escape, as it would seem, a final problem. If each of the things of the universe, taken separately, has been produced for another, for what, to what end, have they, taken altogether, been made? Unity of cause supposes unity of end. If a single cause has made all, it must have made all for a single end; and as the cause is absolute, the end must be absolute. In fine, as there are not two absolutes, the cause and the end must be identical, and, consequently, God must have made the world for Himself.

Here the difficulties commence. If God has made the world for Himself, it is evidently to enjoy it, to find His satisfaction and happiness in it, or else to glorify Himself. The common theological doctrine also is that God has made the world for His glory. But if it be so, whatever be the profit that God derives from the world—glory, disinterested joy, esthetic satisfaction—it matters little; in any case, He was without that joy before He created the world. He created it to procure it. Thus He was deprived of something before the creation, and therefore He was not perfect. For the perfect, as Bossuet says, 'is the being to whom nothing is awanting.' To suppose that God created the world for Himself, is thus to attribute to Him lack and privation. 'This doctrine,' says Spinoza, 'destroys the perfection of God, for if God acts for an end He necessarily desires something of which He is deprived. And although theologians and metaphysicians distinguish between an end pursued *by indigence* and an end *by assimilation*, they yet avow that God has made all for

Himself, and not for the things He was to create, seeing that it was impossible before creation to assign any other end for the action of God than God Himself; and in this way they are forced to admit that all the objects that God proposed to Himself, while arranging certain means to attain them, God had been at one time without, and had desired to possess them.'

Another solution, which is not opposed to the preceding, and which is subordinate to it, is that God has created the world for man, and man himself to honour and serve Him. But we have already said how narrow such a doctrine is, that only sees man in the world, and refers everything to him. This *anthropocentric* doctrine, as it has been called, appears to be connected with the *geocentric* doctrine, that made the earth the centre of the world, and ought to disappear with it. The greatest philosophers of the 17th century, Descartes and Leibnitz, have expressly disavowed it: 'For,' says Descartes, 'even if it be a pious and good thought, as regards morals, to believe that God made all things for us, *yet it is not at all probable* that all things have been made for us in such a way that God had no other end in creating them, . . . for we cannot doubt that there is an infinity of things that are now in the world, or that have formerly been and have now entirely ceased to be, without any man having ever seen or known them, and that have never served him for any purpose.'

If, then, the end of the universe can neither be God nor man (nor *à fortiori* the creatures inferior to man), it seems to follow that we can conceive no end for the universe, which appears to invalidate the whole doctrine of final causes.

No doubt, it is always allowable to a philosopher, as Descartes here does, to suspend his judgment, and to pause in ignorance: this is a natural right in philosophy. We by no means admit that we should be told: Since you are ignorant of such a thing, it follows that you know nothing. Thus, even if the first causes were unknown, it would not

follow that there are no second causes; and even though the last ends should escape us, we would not therefore be obliged to remain ignorant of the existence of secondary ends. In fine, as we rise from second causes to the first cause, without knowing how they communicate with it, it is the same with the relation of secondary ends to the last ends. But, indeed, the argument *ad ignorantiam* ought only to be employed in the last extremity.

Another hypothesis has recently been proposed to explain the wherefore of creation. 'It would seem,' says an eminent philosopher, 'that one cannot comprehend the origin of an existence inferior to the absolute existence, except as the result of a voluntary determination, whereby that high existence has spontaneously moderated, mortified, extinguished, so to say, something of its omnipotent activity. God has made all out of nothing, of that relative nothingness that is the possible, for He was first the author of this nothingness, as He was of being. From that which He annulled in some sort and annihilated of the infinite plenitude of His being (*se ipsum exinanivit*), He has derived by a sort of awakening and resurrection all that exists.'[1]

This doctrine, as we see, instead of explaining creation by a want, a desire, or an imperfection of the Creator, would explain it, on the contrary, by a superabundance, an excess, a sort of plenitude, God having annihilated a part of Himself to make the world of it. Such a hypothesis does not appear much more admissible than the inverse doctrine. We are not less unfaithful to the notion of a perfect being in attributing to it superfluity, a sort of plethora of being, of which it should abandon a part as the gravid female casts its young, than in representing it as a germ that develops and grows. We admit that the supreme name of God is 'grace, gift, liberality;' but never has it been said that the Christian God 'creates the creature from *His own being*:' that is an essentially Oriental and non-Christian notion. The Christian *nihilum* is a true

[1] Ravaisson, *Phil. du 19me siècle*, p. 262.

nihilum, and not a part of the divine substance annihilated.[1] It is, as it would seem, profoundly to alter the Christian dogma to maintain that the world was made of something, even were that something a part of the divine substance. We cannot better reply to this hypothesis than by opposing the author to himself: 'God does not pass entirely into things,' says he elsewhere, in summing up the doctrine of Philo; '*nor does He give them*, properly speaking, *a part of Himself*. He gives, He communicates, Himself, and yet He remains in Himself in His pristine integrity. *Nothing comes from God by separation*, but by a sort of extension that takes nothing from Him. Our soul is something that comes from the divine soul, and *is not a section of it*.'[2] In this interpretation, much nearer the truth, the world is not born of the superfluity of God, of a part of Himself which He had annihilated. Only the word *extension* (ἐκτείνεται) is still saying too much—it gives too much room for the doctrine of emanation; and God is no more augmented than diminished by creation. Creation can thus be considered as a gratuitous gift, without one being obliged to have recourse to the desperate hypothesis of a God who annuls Himself in creating. This metaphysical hypothesis adds nothing in point of probability and clearness to the only doctrine that can explain creation—the doctrine of divine love.

We are thus brought back to the previous dilemma. Either the supreme cause acts for an end adequate to itself, — that is to say, absolute, and that end can only be itself, but in that case it wants something to be entirely what it ought to be, and thus it is not perfect, it is not God,—or else the supreme cause acts for an end that is not itself,—for example, the welfare of created beings,—and then the end is not adequate to the cause. The absolute being acts for a

[1] M. Ravaisson here confounds and involves in his explanation two distinct dogmas—incarnation and creation. Creation already seems an incarnation. This is to transform Christianity into Brahminism or Gnosticism, as M. A. Franck has justly remarked.

[2] Ravaisson, *Essai sur la Métaph. d'Aristote*, t. ii. p. 306.

relative end; the infinite being for a finite end. We cannot seemingly escape from this alternative.

We have already said above,[1] that the difficulty raised by Spinoza would go much farther than he imagines. It is only a particular case of the general question of the relations of the finite to the infinite. In whatever manner this relation is conceived, it may still be said that, if the infinite did not remain eternally alone, it is because it needed the finite to exist. Thus, whether it be held that God produced the world by a necessary emanation, or that He created it freely, the objection still remains the same. Why did He create it? Why did He not remain wrapped up in Himself? The insoluble problem is this: Why is there anything but God?[2] And to solve that problem one would need to be God. But since the world exists, it cannot be in contradiction to the divine nature. To say that this existence of the world has an end, and that that end is God, is not an additional difficulty.

The whole difficulty is to know how God can love anything but Himself; but it is the same difficulty as to know how God can think anything but Himself. That other thing can, according to us, coexist with God without either increasing or diminishing Him, without being added to Him or subtracted from Him, because it is not of a common measure with Him. No doubt this being has its root in Him, but *eminenter*, as the Schoolmen say, in this sense, that, in the idea of the absolute and the infinite, there is contained *à priori* the possibility of an infinite multiplication of being, without any change in the divine substance. This coexistence once admitted (and it is admitted by all philosophers who admit at once God and the world), the wherefore of creation can only be sought in the motive of good. It is by goodness that Plato, as well as Christianity, explains the production of things.

If it be held absolutely that God can have no other end

[1] Book I. chap. vi. p. 215.
[2] See Saisset, *Philos. Relig.* Part ii. 3d Meditation.

than Himself, creation is inexplicable; for, as already possessing Himself, why should He still seek Himself in a roundabout way? If it were Himself He sought through the world, a want and desire would then be legitimately ascribed to Him.

To solve this problem, Malebranche had uttered this singular and profound thought, that the end of creation was the incarnation of Jesus Christ. It was in prevision of the incarnation that the world had been made. The incarnation, in place of being a miracle, on this hypothesis, was reason itself, the ultimate law of the universe. 'God,' he says, 'finds in the incarnation of the Word a motive, not invincible, but sufficient to take the part of creator, a part little worthy of Him without this *denouement* which He finds in His wisdom to satisfy His goodness.'[1] This extraordinary doctrine only escapes the philosophical difficulty to compromise theology. If the incarnation only took place for the glory of God, where is the merit of the Redeemer? What would become of the love and gratitude that are due to Him? But if we separate from this hypothesis all that relates to positive Christian dogma, there remains then the Brahminical doctrine of incarnation,—that is to say, pure pantheism. We have no longer to ask why God created the world, since the world is Himself.

Malebranche admirably says that the world is a 'profane' work, and that to be worthy of God it must become a 'divine' work. But to be divine must it contain God in substance? and is it not enough that it contain Him by participation, *κοινωνία*? All that proceeds from God is divine, from that very fact, and so much the more as it contains more divine expression. That the creation be worthy of God, it is enough that the act itself be divine; it is not necessary that the terminus of the act be so.

The word end may signify two things: either the *motive*

[1] *Entretiens Metaphys.* ix. 1. See *Philosohpie de Malebranche*, by Ollé Laprune, tome i. chap. vii. p. 389.

of the creative act, or the *terminus* of that act. God may act divinely even if the terminus of His action be not Himself. If it be held that God can only act for Himself, it must be held still further that He can only love Himself and will Himself; hence creation is impossible, and yet it exists. If creation be admitted, or the coexistence of God and the world, it must be allowed that God might pass beyond Himself; consequently, that the terminus of His action might be another than Himself. For the act to be divine, it is enough that the motive be so. Whether that motive be derived from His power, His wisdom, or His goodness, or from all the three attributes together, or even though that motive cannot be represented to the human understanding, it is enough that we conceive the possibility of it to prevent the act from losing its divine character, even if its terminus should remain profane.

If God, as absolute perfection, cannot have created the world for an egoistic end (for then the simplest way would be not to create at all),—if, on the other hand, He cannot be supposed to have created by chance and sport (*Ζεὺς ἔπαιζεν κοσμοποιήσας*),—it follows that He can only have made the world in the interest of created beings,—that is to say, by goodness (*ἀγαθὸς ἦν . . . βουληθεὶς ἀγαθὰ πάντα*). Such is, at least, the only way in which the human mind can conceive the reason of creation; such is, translated into human language, the only hypothesis that allows us to conceive the relation of the infinite and the finite, the imperfect and the perfect, the creator and the creature.

But evil?—Evil could only have been to the divine goodness a reason for not creating, if it behoved in the nature of things to outweigh the good in quantity; for that there should be some evil in the creation may very well be an inevitable consequence of creation itself, as the Stoics, the Alexandrians, and Leibnitz have proved. Atheists explain evil by saying that it is an inevitable consequence of natural laws. This explanation is precisely the justification of Providence. If, in effect, evil is a consequence of the laws of

nature, either there must have been no nature, or evil behoved to coexist with nature. Let us suppose, for instance, that pain is a necessary consequence of feeling; either there must have been no sentient beings, or it was necessary that they should suffer. The whole question, then, comes to be, whether it was better that there should be a nature, or that there should be none; that there should be sentient beings, or that there should be none. If death is the consequence of life, God could only prevent death by suppressing life. God is then impotent, you will say. This difficulty has been sufficiently answered. All creation implies condition and limitation, and consequently defect, which is translated into suffering in the region of feeling, and into sin in the region of the will.

The only question, then, is whether the amount of evil outweighs the amount of good in the universe. Only in this latter case would Providence be without excuse. But we believe that experience and reason sufficiently attest that good, not evil, most prevails, not only in the universe in general, but in human life in particular. Leibnitz wittily said: 'There are more houses than hospitals;' and one of his disciples, carrying his thought farther, added: 'There are more cooks than doctors.' It is difficult, for the rest, to decide such a question, if we limit ourselves to appealing to the facts and the humour of each one; the decision will too much depend on imagination and feeling. An ardent and sombre imagination will take all for evil; a sweet and amiable imagination will regard all as good. There must be other principles in order to decide. But if we ascend to principles, I think the word evil can have only one precise sense in philosophy,—namely, a principle of destruction,—while good, on the other hand, is a principle of conservation. Apart from this there is nothing but arbitrariness and fantasy. These definitions being stated, what manifestly proves that good outweighs evil is the fact that the world exists. Whereever the principle of destruction prevails over the contrary principle, nothing continues, and nothing can even be formed.

A people devoted to anarchy necessarily dissolves, or is absorbed by others more powerful. But it is a certain fact that the world continues, and has done so long enough to assure us that it is not by accident. This is a sufficient proof that in the universe, taken as a whole, order prevails over disorder. Nay, more, not only does the world endure, but science teaches us that it has always gone from the simple to the complex, from the less to the more perfect. But the more complex a mechanism, the more difficult is it to preserve. Therefore the conservative force of the universe must always go on increasing; or rather, the principle of good that is in the universe must not only be conservative, but organizing, creative, promotive. There must be enough of good to overflow in new creations, and in creations more and more complicated.

Now these principles may be applied, not only to the abstract good of the universe in general, but also to felt good —to the good of sentient and conscious beings in particular. In effect, what is true of good and evil in themselves, is true of pleasure and pain. Pleasure must be a principle of conservation, and pain a principle of destruction; and from the simple fact that humanity lasts, pain must be infinitely less diffused than pleasure. Schopenhauer, the pessimist philosopher *par excellence*, thinks he can philosophically demonstrate the predominance of pain over pleasure; and he reasons thus: 'All life is summed up in effort, and effort is always painful; therefore life is pain.' This argument may be retorted thus: 'Life is active; but action is always accompanied by pleasure; therefore life is pleasure.' And this latter argument seems to me much more solid than the former. It is by no means true that effort is always painful. On the contrary, it only is so exceptionally, and when it surpasses our strength; otherwise a certain degree of effort is a pleasure, and without effort there is no pleasure. The effort that must be made to climb a mountain, the effort of a hunter in the pursuit of game, or of a thinker in the investiga-

tion of a problem, involves more pleasure than pain; and the pain is only a seasoning to the pleasure. But life in general, in a state of health, only demands a moderate effort, and that effort is just what is needed to feel that we live. Evil, therefore, does not come from effort, but from the conflict between external forces and our own. But now no one can prove that the external forces are necessarily victors in this conflict; rather the contrary is evident, otherwise the human race would not survive.

Leibnitz seems to believe that there is danger in maintaining that the welfare of the creatures is the only end that God proposed to Himself in creating the world; 'for then,' he says, 'no sin nor misfortune would happen, not even by concomitance. God would have chosen a succession of possibilities, whence all these evils would be excluded.' But in speaking of the good of created beings, we can mean nothing but 'the greatest good possible, *salvâ sapientiâ*,' which leaves intact all the explanations of Leibnitz. With this reservation, we maintain that the terminus of the divine action can only be the creature, and not the Creator; otherwise He would not have come forth from Himself, since by hypothesis He is absolute and perfect, and wants nothing.

Is that to say, however, that it is in the feeling of sentient and living beings that we shall find that end without which the universe would not deserve to exist? No doubt the happiness of created beings, living and sentient, is, and ought to be, one of the ends of creation. But is it its last end? Is there in happiness (if it be identified with the good of the senses) a value so great, that God should have decided to create, merely on behalf of our fragile and transient enjoyments? Because God's end in creating was not the absolute itself, does it follow that He could act for an end containing nothing of the absolute? Can we attribute to the Almighty a merely human goodness, that only should propose to give pleasures like a mother to spoilt children? Must not His love understand our good in a higher way than we ourselves

would do if we were consulted? But if there are creatures that have only feeling as their lot, enjoyment is for them the last end. But they themselves are only relative ends to the Creator; and as to the creatures in whom feeling is united to reason, the ends of the former must be subordinated to those of the latter.

Is it, then, intelligence (whether in man or in any other thinking creature) that is the end of nature? Does nature exist, as the Hindus have said, to be contemplated by man or by some reasoning being? 'But,' as Kant profoundly says, 'it is not man's faculty of knowing, the theoretic reason, that gives a value to all that exists,—that is to say, man does not exist that there may be one to contemplate the world. In effect, if that contemplation only shows us things without an end, the mere fact of being known can give no value to the world; and we must already suppose a final end for it, which itself furnishes an end for the contemplation of the world.'[1] Thus, to be contemplated, to be known, is only one of the ends of the existence of the world, and there must be still another for the latter to have any value. Knowledge is, therefore, not the absolute end of the universe.

For these reasons Kant arrives at the conclusion that the supreme end of the universe, being neither in feeling nor in the contemplative intelligence, can only be in morality. 'The most vulgar minds,' says he, 'agree in replying that man can only be the final end of the creation as a moral being. What purpose does it serve, they will ask, that this man has so much talent and activity, that relatively to his interests, as well as to those of others, he has so much value, if he *is without a good will*, if, as regards his inner man, he is only an object of contempt?' In considering not only man, but every moral being in general, as the end of creation, 'we have a reason for being warranted to regard the world as a system of final causes.' The world has as its end to become the theatre, the instrument, and the object of morality. In

[1] *Critique of the Judgment*, § lxxxv.

order to be appropriated to that end, it must already be susceptible of finality; the lower degrees must be the steps whereby nature rises to its last terminus. There must be a succession of *relative ends*, to render possible this *absolute end.*

In effect, morality alone deserves the name of absolute end; and hereby the antinomy mentioned above finds its solution. God can only come forth from Himself for an absolute end; and, on the other hand, if He pursue this absolute end, it seems He can find no other than Himself, and, consequently, that He need not come forth from Himself. But it is one thing to say, God, in creating, had only Himself as end; and another thing to say, God had for end a nature, whose end should be Himself. The terminus of the divine action is nature; the terminus of nature is God. If you suppress the first of these propositions, nature would have no worth by itself: why, then, should God have created it? Why not remain at rest? If, on the other hand, the second be suppressed, nature would no longer have any final, absolute end; and why, again, should God have created it? But His action proceeds from Him, inasmuch as He creates a nature, and it is just this nature, as created nature, that is His object; and it returns to Him, in that this nature, not being self-sufficient, only finds its signification, its reason of being, and its end in the absolute.

But how does nature assume an absolute signification? Is it by self-annihilation in the absolute? No; for then it would have been much simpler not to create it. Is it in being absorbed in it, losing itself in it, and forgetting itself? No; these are so many forms of annihilation. If God created nature, it was that it should be, not that it should not be—to live, not to die. The end of nature is, therefore, to realize in itself the absolute as far as possible, or, if you will, it is to render possible the realization of the absolute in the world. This is brought to pass by morality.

Meanwhile, let us not forget that if there are no ends in the universe, there are none for man any more than for nature;

that there is no reason why the series of causes should be mechanical up to the appearance of man, and become teleological from man onwards. If mechanism reigns in nature, it reigns everywhere, and in ethics as well as in physics. No doubt, there might still be subjective and contingent ends, pleasure or utility; but not unconditional and absolute, not truly moral ends. Morality is, therefore, at once the accomplishment and the ultimate proof of the law of finality.

APPENDIX.

I.

THE PROBLEM OF INDUCTION.

(BOOK I. CHAPTER I. PAGE 25.)

M. LACHELIER, the author of a very remarkable and striking book on *The Foundation of Induction*, and whom we have several times encountered in the course of these studies, has stated very clearly the problem of induction. But when he proceeds to the solution of this problem, he seems to us to fall into the error mentioned by Aristotle, and which he calls μεταβάλλειν εἰς ἄλλο γένος, *passing from one genus to another*. He states, in fact, a logical problem, and answers it by a metaphysical solution. How does one pass from *some* to *all?* he asks (which is a *logical* difficulty). Thought is the foundation of things, he replies. True or false, this reply is *ontological*, and does not touch the question. In a logical point of view the author seems to rest satisfied with the Scottish solution—namely, belief in the stability of the laws of nature. He merely formulates this principle with more precision, by analyzing it into two others,—the principle of efficient and that of final causes.[1] He then hastens on to the ontological question, which is not to the point, or which, at least, does nothing to solve the difficulty stated.

Another philosopher, who has handled the same question, M. Ch. Waddington,[2] seems, on the other hand, to have

[1] It is, besides, still a question whether the principle of final causes forms an integral part of the inductive principle. We do not believe it; for, as we hold, it is only by induction that we can rise to the final cause. See below, page 461.

[2] *Essais de logique* (Paris, 1857), Essay vi. p. 246 et seq.

put his finger on the true difficulty. Precisely expressed, it is as follows:—'What means,' he asks, 'this pretended major, The laws of nature are general and stable? It means that nature is subject to laws, and nothing else. But with such a proposition, the cleverest logician could not prove the truth of a single law. Let us take, for instance, this common proposition, All bodies fall. This sophism will be given us as a valid reasoning: Nature is subject to laws; but some bodies fall, therefore it is the law of all bodies to fall.' The same author rightly says, again, that 'if this belief in the stability of laws were capable of justifying a single induction, it would justify all. Error and truth, the most gratuitous hypotheses and the most constant laws, would alike be demonstrated.' This is, in fact, the real difficulty. The general belief in the stability of the laws of nature, were it admitted *à priori* as a principle, can be of no use to determine any law in particular. Even if I allowed that laws are constant, or, in other words, that there are laws (for law means a constant rule), that would not convince me that a given phenomenon is a law, as, for instance, the fall of bodies left to themselves. The question still remains, How do we know that it is a law? How do we pass from the particular to the general? It is experience, we will be told, that decides. But the question still recurs; for experience only multiplies particular cases, and still I ask, by what sign shall I recognise that a fact ceases to be accidental and becomes a general law? Are we told, by repetition? But what, then, is the virtue of repetition, and what is the number of repeated cases, compared with the infinite, to warrant me to affirm that the induction is made? Such is the persistent difficulty, the solution of which we think we have found in the principle laid down above—namely, that 'the agreement and the coincidence of phenomena require a precise reason, and that with a probability increasing with the number of the coincidences.'

Let us, in effect, resume the inductive question.

We ask how, from a certain number of particular experiences, we can infer a general and universal law without exception? For instance, how, having seen water boil at 100 degrees a certain number of times, we can conclude that the same phenomenon will be reproduced in the same circumstances as

often as the temperature is at 100 degrees. It is a problem; for although the fact has been reproduced very often, and even always, it is only, after all, a small number of experiences compared with the infinite. But we affirm infinitude when we say that everywhere and always a fact will be reproduced.

If it be considered, it will be seen that the real difficulty is not to conclude from the present to the future, but to characterise and interpret the present state. The question is not whether a given law, once proved, will be stable and immutable (that is granted), but whether a given phenomenon is the expression of a law. The question is not whether the same causes will produce the same effects (that is granted), but whether a given phenomenon is a cause and another an effect. For example, I will allow that heat will *always* make water boil at 100 degrees, if I begin by granting that it is really the heat that makes the water boil,—that is, if I grant that heat is the cause and boiling the effect. But that is the whole question. If I grant that, I at once grant that it is a law. The induction is made; the application to the future and to all times is only a conclusion.

But, now, is the relation which I have already proved in fact a law or an accident? This is the real question. Let us suppose, for instance, that this relation is not a law. What does that mean? Is it not to suppose that heat is not a cause, nor boiling an effect? If this be so, the relation between the two phenomena is not *real*, but *apparent*, not *necessary*, but *fortuitous*—in a word, the effect of chance. If the boiling of water at 100 degrees is not a law of nature, I must then suppose that, while certain causes raise the temperature to 100 degrees, other causes, having no relation to the former, have always coincided at the same time to make water boil; if, in fact, I allowed that there is some relation between these two causes, I would thereby allow that there is a law. If I doubt whether there is a law, it is because I do not refuse to believe that chance may produce a constant coincidence so extraordinary. But this is what we justly regard as impossible; and here is the true inductive principle,—here is the difference between true and false inductions. 'What difference is there, in fact, as we said before,[1] between this certain

[1] Chap. i. p. 25.

proposition, Water boils at 100 degrees, and this other, An eclipse is a presage of public calamities? The difference is, that in the former case the coincidence of the two phenomena is constant and without exception, and that in the latter the coincidence does not always occur. Now chance may well bring about sometimes, nay, often, a coincidence between an eclipse and an event so frequent as public misfortunes; but reason refuses to admit that chance brings about a constant coincidence without exception. This coincidence must have its reason of being; the reason is, that one of these phenomena is the cause of the other, or that the two phenomena have a common cause.' In other words, it is a law.

Hence we see why the knot of the inductive problem is in the experimental method, or experimentation. It is not only a *process*, it is the essence of induction—it is the *proof* of it. In fact, by the suppression of presumed causes (*per rejectiones debitas*) we set in relief the capital fact of coincidence; by the method of concomitant variations we render it still more perceptible. Finally, by calculation applied to experiment, and to the presumed hypothesis, drawing beforehand the most remote possible consequences from the facts,—consequences which new experiments permit us to verify,—we raise new coincidences confirmatory of the first, and unintelligible if there be not here a true cause. It is thus that *repetition*, which would be insignificant if it merely had reference to the number of the facts (since we are always equally remote from the infinite),—it is thus, I say, that repetition acquires a logical value. In fact, the improbability of coincidences is the greater the oftener they are repeated. From this, also, we see how it may happen that a single experiment suffices for proof, because it is such a coincidence as could scarcely occur even once, had it not its reason in the laws of nature. This is what causes great scientists rarely to mistake the worth of a significant fact, though occurring only once. It is said that Sir C. Bell would not repeat the famous experiment that established the difference between the motor and sensory nerves, so much did his feelings recoil from causing animals to suffer. Does any one believe that he was, therefore, in any doubt of his discovery? The Abbé Haüy lets fall a piece of quartz, and merely by observing the fracture, he at once

concludes that he has discovered a law of nature; for what is the likelihood that a mineral should break by chance according to the laws of geometry? So in a thousand cases. The knot, then, is not in the repetition itself, but in the fact of the coincidence; only the repetition evidently adds much to the value of the coincidences.

The first affirmation being once established, the rest follows of course, and the application to the future no longer presents any difficulty. For if a given phenomenon is the product of a given cause, it manifestly follows that, the cause being given, the phenomenon will follow;[1] as Spinoza says, *ex datâ causâ determinatâ necessario sequitur effectus.* This reciprocal of the principle of causality is as true as it, and is only that very principle reversed.

Induction is thus composed, in our view, of two elements, and is reducible to two propositions, the one synthetic, the other analytic. The first is this: Every constant coincidence of phenomena has its reason of being (whether in the causality of one of the phenomena in relation to the others, or in a common causality). The second entirely analytic proposition is this:

[1] It is here that, according to M. Lachelier, the second law, or law of final causes, would intervene, which, with the first or law of efficient causes, would compose the inductive principle. We do not, in fact, merely affirm this hypothetical proposition: *if* such conditions are given, such an effect will follow. We affirm a categorical proposition—namely, *that* such conditions are in fact given. Our confidence towards nature is not problematical; it is affirmative, as Kant would say. But this confidence implies that nature has an interest in preserving the order of things, which is at bottom the principle of finality.—We do not for ourselves believe that the difference between the *if* and the *that* (the τὸ εἰ and the τὸ ὅτι) has so great a range here as the author would make out; and we still resolve the difficulty by the same principle as above. In fact, whatever may be the future stability of the order of the world, it at all events holds good that this order has existed hitherto. Now this order is the resultant of an infinite number of coincidences, which must have taken place to produce equilibrium; but chance cannot have brought about such a mass of coincidences. Therefore the order of the world, not in the future, but in the past and the present, supposes a precise cause, a cause of order. This cause being given, it follows, of course, that it will continue to act conformably to its nature; in other words, that order will last as long as we perceive no indications to make us suspect the contrary. What proves that there is no *à priori* belief in this, is that Newton had come by the study of facts to believe that the system of the world would become deranged, and would need a new act of divine power to re-establish it; and, again, it is by the study of facts that this doubt has been set aside. Belief in the stability of nature is thus only one of the results of induction, in place of being its foundation.

A given cause (considered in the same point of view and in the same circumstances) always produces the same effect which has once been given.

Thus the real difficulty of induction is not, yet once more, the application to the future, for that results from the very nature of things. It is in the proof of a constant coincidence between two phenomena. But it is in the demonstration of this coincidence that the experimental method is employed; it disengages all the accessory circumstances to preserve only the fact and its determining condition. This coincidence once discovered, it is no longer necessary even to repeat the experiment very often, and the mind at once infers a determinate relation between the two facts.

We have just explained the principle of induction. Something more is needed for finality. But it is still the same mode of reasoning; and if we refuse to admit the one, there is no reason to admit the other.

In fact, the same reason that makes us suppose that every coincidence of phenomena has its reason, ought also to make us suppose that every agreement of a complex whole with a future phenomenon more or less remote must also have its reason; and if this reason were not given in the future phenomenon itself, it would necessarily follow that the agreement of the complex whole with that consequence, so well prepared, would be a fortuitous rencounter. This is the objection that absolute mechanism can never dispose of. It is obliged to assign a considerable part to the fortuitous—in other words, to chance. But by parity of reason I might as well say that chance is the primary cause of every coincidence, that all is fortuitous, accidental, and contingent—that is, that there is no science. In fact, if it is not repugnant to you to say that the extraordinary harmony and the amazing finality manifested in the sexes are only a result of concomitant mechanical causes, I do not see why I should not say that the constant correlation of heat and dilatation, of clouds and lightning, of vibrations and sound, are only mere rencounters, accidental coincidences of certain mechanical causes acting separately, each in their sphere, without any agreement or reciprocal action, and perfectly strange to each other. It matters little, it will be said, that from the point of view of things in themselves these

causes and effects are really connected, provided they appear so to us; it matters little that they are divergent and strange causes, that are found by chance acting together, or veritable connections; it is enough for us that these connections appear in experience to affirm them, and we do not go farther. With equal right we can reply: It matters little that from the point of view of things in themselves it may be supposed that an unintelligible concomitance of mechanical causes may produce the agreement of means and ends; it suffices that this agreement be given me in experience, to warrant me to reason as if it resulted from a veritable intrinsic concordance, and from an objective adaptation.

It is said that finality is an entirely subjective conception, which cannot be justified by experiment. By this it is evidently meant that the principle of induction, on which all the positive sciences rest, would, on the other hand, be verifiable by experiment. But that is a mistake, and the difference sought to be established between the principle of finality and the inductive principle is altogether apparent. In other words, I can no more verify mechanical causality than finality.

Wherein does experimental verification, in fact, consist? It consists in the artificial and voluntary reproduction of a certain coincidence of phenomena which has previously been furnished to me by observation. What, then, does experiment do? It simply multiplies coincidences. But if I had not already this preconception in my mind, that every constant coincidence has its reason of being in the nature of things, every new fact would teach me nothing more, and I could always suppose that it is chance that brings to pass such an apparent agreement of phenomena. This postulate, then, is indispensable to science — it is science itself; and yet it cannot be verified. It is not, then, superior in this to the principle of finality. To arrive at a veritable and absolute verification of induction, we would need, on the one hand, to exhaust the infinite series of phenomena, and, on the other, to know the essence of things in themselves. But both are alike impossible for us, and still no scientist doubts the truth of induction; and it does not even require the coincidence of facts to be reproduced very often for him to infer a necessary and essential relation.

It ought not, then, to be objected to the principle of finality that it is a subjective and unverifiable point of view, for that is also true of efficient causality. If we are told that experiment has more and more brought to light constant connections, we reply that the same experiment has more and more brought to light relations of finality. The first men and the first sages —Socrates, for instance — were only struck with the most apparent ends,—the legs made for walking, the eyes for seeing, and so on. But in proportion as science has fathomed the organization of living beings, it has infinitely multiplied the relations of finality. If it be said that false final causes have been assumed, we reply that false efficient causes have been assumed. If we are shown in nature things whose end we do not know, we reply that there is an immensity whose cause we do not know; that even if there are some that apparently do not agree with the principle of finality,—for instance, monsters, —there are also phenomena that may have appeared to unreflecting minds to depart from the ordinary laws of causality— namely, prodigies and miracles. In fine, as the entanglement of causes limits the action of each of them, and often prevents us from isolating them, so the entanglement of ends may also well counteract and connect them so as to prevent us from unravelling them with precision. In a word, there is a perfect parity between finality and causality; and he who denies the former might just as well deny the latter. But whoever denies causality denies science. The belief in finality, so much disputed by certain scientists, is founded on precisely the same principle as the belief in science itself.

II.

CUVIER'S LAW.

(Book i. Chapter i. Page 46.)

CUVIER'S law, as a whole, remains one of the fundamental laws of zoology. It has, however, given rise to various difficulties, and we have here to inquire how far these difficulties might invalidate the deductions we have above set forth.

Blainville, for instance, keenly assails the claim of Cuvier and his disciples to be able to reconstruct a lost animal from a single one of its fragments, in virtue of the law of correlation of the organs. 'This principle may be true,' he says,[1] 'of the general form of an animal, but it is far from being applicable to each fragment of each of the parts. One may infer, it is true, from the form of the bones that of the muscles, because these two kinds of organs are made to produce together one single function, one and the same action, which the one could not produce without the other; still this is true only of the vertebrates. . . . But to infer, even from the teeth, the form and proportion of the skeleton, becomes impossible in the feline genus. The teeth all show us a carnivorous animal, feeding on living prey, but as to inferring from them the osseous system of a tiger or a lion, the differences are so small that you will never accomplish this. When you come to the different species of lions, only distinguished by their hair, the one having tufts of hair on the flanks, the other not, it would be impossible, from these simple parts of the skeleton, to distinguish the one species from the other. . . . M. Cuvier himself found his principle at fault. The *tapyrium giganteum*, which he had determined from a single complete tooth, turned out to be, when the whole head was discovered, with teeth absolutely the same, a *dinotherium*, an extinct

[1] Blainville, *Histoire des sciences de l'organisation*, t. iii. p. 398.

animal, which is not a tapir, and seems to be an aquatic pachyderm, like the morse, although very different. This principle of M. Cuvier is, therefore, false as a general rule, even confining it to the teeth, where yet its application is more frequently possible.'

These observations of Blainville, the weight of which it is not for us to judge, may prove, supposing them well founded, that the range of Cuvier's principle must not be exaggerated, and that it were an illusion to think that with any fragment of a bone one could reconstruct, in all the details of its organization, an extinct animal. But it is, from our point of view, sufficient that it may be done for a certain number of animals, and for the general form of the skeleton. Even if such a method should not yield the species, but only the genus or the family, this would itself be a very important principle; and a harmonious connection, though reduced to the most general conditions of organization, would still be infinitely above forces of a purely blind nature; for the rest, reserving entirely the explanation of such correlations, as of each organ in particular, by the hypothesis of *selection*, discussed in the seventh chapter of our first part. Setting aside this hypothesis, and every other of the same kind, for the present, the only point we would here maintain is that the more or less latitude allowed to Cuvier's law by naturalists (of which they remain sole judges) still leaves to that law a large enough share of truth to warrant our inductions.

Another objection taken to this law is that, supposing it well founded as regards the superior animals, and particularly the vertebrates, to which alone Cuvier has applied it, it is far from being so as regards the inferior animals. The correlation of the whole to the parts in these animals is so far from being strict, that they may be cut through without ceasing to live, and that these sections can reproduce the entire animal. This takes place in the case of the naiads, hydras, etc. In these animals there seems to be no more connection between the parts than there is between the different parts of a mineral, as they may be divided without being destroyed. Thus these parts are not reciprocally means and ends to each other.

M. Milne-Edwards has given a very satisfactory explanation of this singular phenomenon.

'To comprehend this phenomenon,' he says, 'in appearance so contrary to what the higher animals exhibit, we must first of all examine the mode of organization of the polyps of which we have just spoken. These animals are too minute to be well studied by the naked eye; but when observed by the microscope, it is found that the substance of their body is identical throughout. It is a gelatinous mass, containing small fibres and extremely minute globules, and in which no distinct organ is perceptible. But, as we have already remarked, identity in the organization supposes identity in the mode of action, in the faculties. It follows that all the bodily parts of these polyps, having the same structure, must fulfil the same functions; each of them must concur in the same manner as all the others in the production of the phenomenon of which the totality constitutes life; and the loss of one or other of these parts ought not to involve the cessation of any of its acts. But if that is true, if each portion of the body of these animals can feel, move, take food, and reproduce a new being, there seems no reason why each of them, after having been separated from the rest, might not, if placed in favourable circumstances, continue to act as before, and why each of these animal fragments might not reproduce a new individual, and perpetuate its species, a phenomenon to which Tremblay's experiment bears witness.'

This explanation shows us that the fact in question is in no way contrary to Cuvier's law. This law is evidently only applicable to the case in which organs as well as functions are specialized, and is manifested more and more in proportion as the division of labour increases. As Mr. Herbert Spencer says, 'integration is in proportion to differentiation.'

Thus it is no wonder, as M. de Quatrefages has likewise remarked, that Cuvier's law, incontestable in the higher animals, fails in the lower animal kingdoms. For instance, in the molluscs, according to this naturalist, great changes may take place in certain organs, without such corresponding changes in the relative organs as might have been expected. Organic forms in these animals are not connected so rigorously and systematically as in vertebrate animals. The law of organic correlations is thus only a relative, not an absolute law.

It may be conceived that the conditions of animal nature are less and less rigorous in proportion as we descend the scale. Where life is more sluggish, less complex, co-existences should be easier, and incompatibilities rarer between the different organs. Suppose an intelligent animal: this fundamental condition immediately implies a very considerable number of secondary conditions, exceedingly delicate, bound together most exactly, so that, one failing, the whole being suffers or perishes, or even absolutely cannot be. Suppose, on the other hand, a living animal of a torpid and merely vegetative life, in external conditions favourable to its development; the bond between its different parts might be very feeble and loose, without hindering its preservation. However, even here, it seems to me impossible that there are not certain incompatibilities and correlations, which the theory indicates as behoving to be, in proportion to the degree of complication the animal presents. Thus there cannot but be a certain relation between the organs of nutrition and those of motion; and this relation must be determined by the ease with which the animal, according to the medium in which it lives, finds its prey. Thus, even in the republics of polyps, there must be necessary correlations, without which they would not exist.

III.

LESAGE OF GENEVA AND FINAL CAUSES.

(BOOK I. CHAPTER II. PAGE 56.)

LESAGE, a celebrated natural philosopher of Geneva, known by his *Lucrèce Newtonien*, had projected a work which seems, although from another point of view, conceived on a plan analogous to that of Kant's *Critique of the Judgment*. It was, as we are told by Prevost of Geneva, his editor and friend, a *Theory of the ends of nature and art.* He was to have called it *Teleology;* and by this work he responded to the desire of Wolf, who, in the preface of his *Logic*, had uttered the wish that the doctrine of ends were handled apart, as a body of distinct science. Unhappily this work of Lesage has only come down to us in the form of detached fragments, sufficiently obscure,[1] and it is difficult for us to form a just idea of the method he meant to follow, and of the principal thoughts he was to develop in it. We shall extract from these fragments some of the ideas that appear most interesting.

Lesage himself, in the preface of his *Essai de chimie mécanique* (pp. 92 and 93), tells us how he had conceived the object and plan of his treatise. He says: 'It would be possible to give a theory of ends, which should embrace the works of art and those of nature, and which, after having furnished *rules of synthesis* for the composition of a work on given aims with given means, should propose *rules of analysis* to discover the views of an agent by the inspection of his works.'

According to this passage it may be supposed—1st, That Lesage behoved first to give the theory of ends, beginning with the consideration of works of art, and thence to pass to the works of nature; 2d, That in the former case, knowing the

[1] These fragments will be found, as well as the *Lucrèce Newtonien*, in the *Notice de la vie et des écrits de Lesage*, by Pierre Prevost (Geneva, 1805).

cause that acts (namely, the intelligent cause), and being able to observe it when it acts in pursuit of ends and by determinate means, he would have derived from this observation the general rules of an action directed in order to an end, and these rules might be called rules of synthesis, because they would be derived from a knowledge of the cause; 3d, That from these rules of synthesis he must derive rules of analysis, which should admit of rising from the effect to the intelligent cause, when the latter is not given, and to determine by the examination of a work the ends that have controlled it. He even behoved, whether in the first or the second part, not to rest satisfied with logical rules, but to employ even mathematical principles, as appears from a sort of table of contents, where this title occurs: '*On the greatest and least* of the mathematicians. Or on the best and the least bad in general. An illustration from the cells of bees.'

The fragments that remain nearly correspond to the plan indicated. They consist of two chapters, the one upon the *synthesis*, the other upon the *analysis of ends.*

Synthesis of ends.

Definitions.—Lesage defines the *end* nearly as we have ourselves done at the beginning of this work.

'The effect of an intelligent cause, considered in so far as it has known and willed it, is called the end of that cause.'[1]

'All intermediate causes are called *means of execution,* or simply the *means.*

'When the means are considered as ends, that on which the ordaining cause immediately acts is called the *proximate end;* all the others, if there are any, are called *remote ends;* and that in which all the means terminate is called the *last end.*'

Thus the former are called subordinate ends in relation to

[1] Afterwards he defines the *final cause* as '*the motive* that determines an intelligent being to will an *end.*' I know not whether it is admissible to confound the final cause with the motive. It seems that from the habitual use of the word, the final cause is nothing but the end itself; it is the end, considered as one of the causes of the action. The motive is an *impulsive*, and not final cause. Accordingly Ubags very well says: 'Differt *finis à motivo;* nam motivum causa impulsiva dicitur. . . . Tempus amœnum v. g. ambulationis motivum, sed non finis esse potest. Ergò omnis finis motivum, sed non omne motivum finis quoque est' (Ubags, *Ontologia*, chap. iii. § 4).

the last, which is the principal end, and which, for the same reason, alone deserves the name of end.

From this important principle, Lesage infers the following consequences:—

'When two aims conjoined in an object cross each other, the ordaining being will have to sacrifice more or less of each, in order to take the best of all the imperfect executions of each. In this choice two motives must decide him, —the importance of each aim for the principal end, and the degree of contrariety that is found between the execution of this subordinate aim and that of the other or others.

'Thus, 1st, If one of the aims conjoined in an object were much more important than the others, and were at the same time very contrary to them, all these less aims would gradually disappear.

'2d, If the different aims were nearly equally important, and nearly equally opposed to each other, they would also be nearly equally well executed—or ill, as the case might be.

'3d, If there were a very great inequality of importance in the ends, but the execution of the least did extremely little injury to the execution of the greatest, these least would be almost perfectly fulfilled.'

From this last rule Lesage concluded, in response to a celebrated word of Diderot, 'that there is no absurdity in conceiving the Eternal Being occupied in folding the wing of a beetle or in proportioning the cell of a bee.'

To prove that, when an agent pursues several aims at once, he makes a less perfect work than when he has only one, Lesage cites the following examples:—

'Nocturnal birds have the pupil of the eye very open; for the same reason they do not see so well by day. An alternate dilatation and contraction of the pupil might render the same eye equally fit for seeing by night or day; but this flexibility of the fibres of the iris would at the same time render the organs feebler and more fragile, and would injure the animal more than help it. An intelligent Creator has thus had to take a mean between an injurious flexibility and absolute rigidity. . . . So birds are usually less fit for walking in proportion as they are adapted for flying.

'When the execution of a project gives occasion to some

reparable inconvenience, of all the remedies that may be applied, those are the most useful that arise from the evil itself. . . . The skin which heat renders dry is moistened by the very glands that it covers, and which the heat opens when it renders the moisture necessary.'

Such was to be the first chapter of the work, containing the synthesis of ends. Lesage added this note: 'There are too many scholastic distinctions in this chapter, and *not enough of rules.* I intend to double the latter and reduce the former.' Thus it is evident that the chief originality that Lesage purposed was to give the rules of a work composed in reference to ends.

In principle, he would only have needed to take his examples from facts where ends are granted—namely, from human acts; but, in reality, he borrowed them indifferently from this sphere and from that of nature.

Let us pass to the second chapter, which was to contain rules 'for discovering the ends of a system.'

This second chapter is more obscure than the first, and does not correspond to what the title promised. We shall extract from it the following passages:—

'Thus, there being a system to examine, there are an infinitude of hypotheses which may correspond to it more or less perfectly; but they all occur between these two extremes —1st, The system in question has no other arrangement than it has received from chance, or, what is the same thing, there are no ends; 2d, This system is in all its parts, and in all respects, the work of an intelligent cause.

'The hypothesis that attributes a system to chance may be confirmed or overthrown by comparing the known laws that chance follows with the usages of the proposed system.[1]

'The supposition of an intelligent cause which fulfils its ends with all possible precision is not a complete hypothesis—some end in particular must still be attributed to it; but, in order not to do it by chance, it will be well to make the following observations:—

'1. The end of the author of a work is one of the effects of that work.

[1] This is nearly the fundamental idea which we have ourselves endeavoured to develop in this treatise.

'2. All the parts of the work must tend to the execution of the most perfect end, whether as a direct means or as a remedy for obstacles; or else, if there are parts and effects of this work which do not directly tend to the end, these parts and effects are necessary and inseparable accompaniments of the most perfect execution of the end.

'3. When in a work a part is observed that has no effect but to stop a certain movement, this movement must also be contrary to the end.

'4. One should avoid attributing an end to a very intelligent being, when the execution of that end is produced by very complicated means, while simpler ones are known that would have produced the same effect. And if one hesitated between two ends, it would be necessary, other things being equal, to attribute to him that which appeared to be accomplished by the simplest means.

'5. When uniformity among several beings is perceived, it should be supposed that they are made for the same end if they are perfectly similar, or for ends nearly alike if they only nearly resemble each other.

'6. In general, when we perceive observed in a work the rules that intelligent beings follow in their operations (Chap. I.), it must be supposed that these rules have effectually given rise to the phenomena which leads to the supposition of an end, the end of the author's system.

'When we have once fixed on an effect, and inquire whether it is effectually the universal end, we must not abandon our hypothesis even if we find effects or parts that, considered by themselves, appear not to be entirely conformed to the universal end; for we have seen (§§ 3 and 4) that a universal end may be subdivided into several partial ends that may cross each other.'

Following these two chapters there is a third fragment, entitled, '*Concerning Variety*,' and which is not very distinctly connected with the preceding. We shall extract from it some laws interesting from the point of view of finality, which the author had himself extracted from a much more complete work, of which he tells us 'the deciphering had become impossible to him.'

'1. The quantity of breath in a given time, other things

being equal, is in proportion to the surfaces, while the quantity of moisture thus furnished is in proportion to the volume of the animal. But as we descend to the smallest animals, the surface decreases in a less proportion than the volume. Thus the perspiration of small animals would be too great, relative to the mass of their humours, if their skin were as porous as that of the large animals. Hence it was suitable that the skin of insects should be a kind of shell, as is the case.

'2. The force with which a fruit tends to detach itself from its stalk is in proportion to its weight or its inertia,—that is, in both cases, to the cube of its dimensions,—while the resistance opposing it is in proportion to the transverse section of the stalk,—that is, merely to the square of the dimensions. Thus it was necessary that great fruits should have stalks still greater than if they were exactly like the small. We also see that high plants either do not bear large fruits (according to La Fontaine's remark in his *Mathieu Garo*), or bear them fastened to the trunk and the chief branches, as is the case in some Indian trees.

'3. That the weight of herbivorous quadrupeds be proportioned to the resistance of their neck, it was necessary that those with the largest heads, like the ox, should have a still larger neck than in proportion to the corresponding dimensions; or else that, like the camel, they should have a smaller head than others, in proportion to the trunk, the neck usually vertical, and be able to sit gently down to take their food on the earth or ruminate it; or, in fine, that if too large for these expedients sufficing without inconvenience, as in the case of the elephant, they should have almost no neck, but a member fit for seizing their food in mass, for sucking up their drink, and conveying both into the mouth. And all this is found realized in nature.'

We know not whether these relations, or others like them, are generally verifiable in zoology; we quote them as examples of an attempt to reduce to scientific principles the theory of finality.

The extracts we have just cited suffice to give us some idea of what the *Teleology* of Lesage would have been if he had had time to execute it. It would have been, evidently, a

book of quite a different nature from the treatises of physical teleology so numerous in the 18th century. It would have stated general principles, rules, theorems, instead of confining itself to the enumeration of examples. However, according to the fragments that remain to us, it seems the author rather proposed to furnish us with rules to determine the ends of nature than to give the proof that there are ends, and the precise criterion of their existence. His work would rather have been a theory of ends than a critique of finality. It was not yet the work of Kant, but it would have been more than the works of Derham and Paley.

IV.

GEOFFROY ST. HILAIRE AND THE DOCTRINE OF FINAL CAUSES.

ANATOMY, equally with physiology, has protested against the exaggerated use of the principle of final causes. G. St. Hilaire severely condemned this, which he called the Aristotelian method, exclusively confined, according to him, to the consideration of the forms and uses of organs.[1] He accuses this method of not having perceived the profound analogies of organs hidden under innumerable differences of form and structure, or at least only to have seized such of the analogies as strike the eyes of the vulgar, and of furnishing no scientific method for disengaging the hidden relations. He says, 'It stops at the very moment when it should be didactic, when it would need to become an Ariadne's thread to discover more hidden relations. . . . This method consists,' he says again, 'in following, step by step, what it calls the degradation of forms, beginning with man, whom it would consider the most perfect creature. At every moment of its researches it is *upon an almost similar*, whence it descends to each comprehensible difference. The orang-outang's hand is nearly that of man, but differs from it by a shorter thumb and longer fingers. . . . Thence we pass to the hand of the *ateles*, defective in a very different way, for in one of the species of this genus there is no thumb at all. Passing to other monkeys, the five fingers are still seen,—the *very nearly* still continues; but the moment we examine the differences, we perceive it is no more a hand. . . . Proceeding to the bear, their paw is still very near the monkey's hand, . . . but the differences here are more pronounced. I pass over several and come to the otter. Here a new circumstance is

[1] Geoffroy St. Hilaire, *Philosophie Zoologique*, 'Preliminary Discourse.' We are obliged, in quoting this illustrious naturalist, to respect the detestable style in which he has expressed his great and profound thoughts.

found; the fingers of this mammifer are united by large membranes. This *nearly the same thing* has thus strangely changed its form; and as it gives the animal powerful means of natation, they are called fins. The method does not go farther: it ends with the unguicular mammifers.'

On this Aristotelian method, which G. St. Hilaire accuses Cuvier of having slavishly adopted, he makes two criticisms: 1st, It is, according to him, neither logical nor philosophical. 'At every moment one is forced to appeal to a half-resemblance, a presentiment of relations not scientifically justified. A vague idea of analogy is the link by which these observations of different cases are connected. Is it logical to conclude from resemblance to difference, without having previously explained what should be understood by the nearly similar? 2d, This method is insufficient. You have stopped at the cloven-footed mammifers; and it would be necessary to come to the feet of ruminants and of horses. But there the differences appear to you too considerable. . . . The method remains silent. It was a guiding clue; it is broken; we change the system.'

Accordingly it would be wrong, thinks the same naturalist, to regard Aristotle as the founder of comparative anatomy; he had the presentiment of it, but had not its method. To make an exact science of comparative anatomy, there is needed a philosophical and strict principle, that permits to seize with certainty not almost resemblances, but evident and strictly demonstrable analogies. This principle, discovered by G. St. Hilaire, and which has remained in science, is what he calls the law of *connections*. We have already seen that G. Cuvier also himself discovered a great law, the *law of correlations*. It may be said that these two laws together contain the whole zoological philosophy of these two eminent naturalists.

We already know Cuvier's law. It rests on this simple and evident idea, that, in an organized being, all the parts must harmonize together to accomplish a common action. The law of connections, again, rests on the fact that an organ is always in a constant relation of position with any other given organ, which, in its turn, is in a constant relation of position with another; so that the position may suffice for

the recognition of the organ under whatever form it occurs. Let us notice the difference between connections and correlations. Correlation is a relation of action, co-operation, finality. Connection is an entirely physical, mechanical relation of position, of dovetailing in some sort. In a machine, the remotest parts may be in correlation: those only that are near and fit together are in connection, at least according to the language of G. St. Hilaire. But connections appear to this great anatomist much more interesting than correlations. If you neglect the physical bond that attaches, according to a fixed law, one organ to another, you will let yourself be deceived by appearances. You will attach an exaggerated importance to the forms of organs and their uses; and those differences, so striking to superficial eyes, will hide from you the very essence of the organ. Analogies will disappear under differences. There will be seen as many distinct types as accidental forms. The unity of the abstract animal, that is hidden under the diversity of organic forms, will vanish. If, on the other hand, you fix the idea of an organ by its precise and certain connections with the adjacent organs, you are sure not to lose sight of it, whatever forms it may affect. You have a clue that enables you to recognise the type under all its modifications, and in this way you will attain to the true animal philosophy.

We may give an idea of G. St. Hilaire's method by a very simple example furnished by himself. It is necessary, he says, to set out from a determinate subject,—that is to say, from a precise piece, always recognisable. This piece may be, for example, the terminal portion of the anterior extremity. That extremity, in all the vertebrate animals, is composed of four parts,—the shoulder, the arm, the fore-arm, and a last section, capable of assuming very diverse forms (hand, claw, wing), but which, under all these secondary modifications, has always the common essence of being the fourth section of the anterior member. Where the third ends the fourth begins. This is a fixed datum that determines the organ; its use, on the other hand, only determines it in a superficial and quite vulgar manner. What more different than a hand, a wing, and a fin, in the eyes of the vulgar? For the anatomist they are one and the same thing. This the school of Geoffroy

calls the anatomical element. But in following this method, in ascending from organ to organ, from connection to connection, observation reveals this law to us: 'An organ may be annihilated, atrophied, never transposed,' which is called the law of connections.

The following are, according to G. St. Hilaire, the advantages of the new method compared with the old:—'1st, It is not a disguised repetition of old ideas on the analogies of organization. For the theory of analogues from the outset declines the consideration of form and functions. 2d, Not only does it extend the old bases of zoology, but overthrows them by its recommendation to keep to a single element of consideration as the first subject of study. 3d, It recognises other principles, because, in its view, not the organs in their totality are analogous, which is always the case in animals nearly similar, but the materials of which the organs are composed. 4th, Its precise aim is different; for it requires a mathematical strictness in the determination of every kind of material by itself. 5th, It becomes an instrument of discovery (example, the hyoid bone). 6th, In fine, the theory of analogues, to be always equally comparative, confines itself in this case to the observation of a single order of facts.'

Has the law of connections the range that G. St. Hilaire attributed to it? Can it lead to all the consequences that he has deduced from it? We will not venture to determine. But without prejudice to the range of the law, it is incontestable that there is in it a profound idea, and which must certainly have led to the perception of relations and analogies that the school of Cuvier, not directing their attention to that quarter, may have failed to recognise. The consideration of functions—so rigidly excluded by G. St. Hilaire, so highly recommended by Cuvier—evidently behoved to turn away the latter and his disciples from the consideration of the anatomical elements, analogous by situation and relation, profoundly different in structure and function. It must either be believed that principles do not involve their consequences, or it must be presumed that Cuvier and his disciples ought especially to direct their attention to the differences of animals and ignore the analogies; while the school of Geoffroy, guided by the master's principles, must have been particularly struck by

these analogies, and consequently have extended the synthetic knowledge of the animal kingdom.

But now, does this mean that Cuvier's method was, as G. St. Hilaire alleged, unphilosophical, superficial, obedient to vulgar prejudices, and, in fine, unfruitful? These are unjust accusations. How can a method be accused of sterility that has given birth to palæontology? Attempt by the principle of connections to reconstruct the fossil world, and you will not succeed. In effect, given an anterior member wanting the fourth section, how can we divine, from the sole fact of the connection, the form this fourth section must have taken, and thereby the form of all the organs awanting? The law of connections serves to find the unity in a given variety, which is doubtless a great philosophical object; but it does not serve to find variety by unity. In the most varied and complex forms it can disengage the anatomical element. But given this element, it cannot reconstruct these varied and complex forms, which are animality itself. In a word, in the law of connections, and in G. St. Hilaire's method in general, which is usually considered as synthetical, I would prefer to see a method of analysis, and in that of Cuvier, which passes for analytic, a method of synthesis. The former will reduce abstract organization to its elements; the latter will reconstruct organizations by means of their elements. The former is like a chemist, who should show you the identity of the elements composing coal and the diamond, which is an analysis; the other is like a chemist who, with given elements, reconstructs organic substances that had so long escaped synthesis. The prominent character of synthesis is reconstruction. But that is what least admits of dispute in Cuvier's zoological philosophy.

If we compare, in yet another point of view, the law of correlations and the law of connections, it will appear that the first gives us unity and harmony in the animal itself, the second unity and harmony in the animal series. Given an organized being, you can consider it in itself, or in the series of which it forms part. In itself, you find that all the pieces composing it are bound together by a final aim, which is its unity, its form, its essence. This is what Cuvier's law expresses. Compared, again, with other beings of the series,

it shows constant relations under the most diverse forms; it expresses in its way one and the same type with all those of the same series. This is what G. St. Hilaire's law expresses. The first gives us a profound and philosophical idea of the organization in itself, the second gives us a philosophical idea of the animal scale, of the organized series. Why sacrifice one of these two ideas to the other? That of Cuvier is not less philosophical than that of G. St. Hilaire, but it is so at another point of view. The latter was wrong, then, in accusing his rival of using a method more superficial than philosophical. But it must be owned that Cuvier was equally wrong himself; for he accused G. St. Hilaire of taking abstractions for realities, vague resemblances for certain analogies. Doubtless, said he, there is something common between all animals, and this general analogy had struck the vulgar long before the savants, since they have combined them under the common name *animal;* but from this to a precise and determinate unity of type there is an abyss that only hypothesis and imagination can overleap. These observations might be justified by the abuse that Geoffroy and his school made of the principle of analogy; but they did not apply to the law of connections, taken by itself. For, on the contrary, that law (the range and limits of which we are not to measure) furnished a certain and precise principle of comparison; for the superficial analogies perceived by the vulgar, it substituted rational and more profound analogies.

Finally, in order duly to judge the doctrine of unity of type and composition, it would have to be considered, not merely as G. St. Hilaire expounded it,—a single man being unable to derive from an idea all that it contains,—but as it has emerged from the labours of a great number of naturalists, his contemporaries or successors, Gœthe, Oken, Carus, Candolle, etc. But from all these multiplied labours, into the particular examination of which it does not belong to us to enter, it results that an organ may not only be modified and take the most diverse forms in the different animals and plants (by atrophies, abortions, changes of dimension, unions, separations, etc.), but, besides that, in the organized being itself the different organs are again but the same organ modified. Gœthe has

shown this in his treatise on the *Metamorphosis of Plants.* In his view, all the organs of the plant are only the leaf transformed; and this view has been adopted by most naturalists. So in the animal organization, he was the first to recognise the analogy of the skull with the vertebral column, an idea now generally adopted, and the demonstration of which belongs to the naturalist Oken. This way has been followed out; and the decided partisans of this bold method have tried to reduce to the vertebrate principle even the breast-bones, and some of them even the members. In fine, the osseous system itself has appeared a modification of the muscular system. Following all these ways, the school of unity reaches this double conception: 1st, A universal vegetable type, reducible to a branch bearing leaves; 2d, A universal animal type, reducible to a digestive cavity surrounded by a muscular sac provided with appendages. Finally, a still bolder school, carrying abstraction farther, would reduce the elementary idea of the organization to the cell, and would only see in the vegetable or animal two different systems of agglomeration of globules.[1]

Doubtless, if we believe the objections of Cuvier and his school, it is possible that the doctrine of unity of type may have been exaggerated; but leaving this point to naturalists to debate, and taking the idea of the organization as it is given us by the school of G. St. Hilaire, let us see whether it contradicts the idea that Cuvier has given us of it. In no manner. For even if it were true that nature only employs a very few materials, or even a single element endlessly modified, to produce all organized beings, still all these modifications must produce in each living being forms and organs compatible with each other, and harmoniously connected. Whether the skull be a vertebra or not, it is no less true that the vertebra only takes this remarkable form when it has to contain a brain. Thus there is always a harmony between the skull and the brain. Thus it will always be admissible to remark, that where the spinal marrow expands under the form of the encephalon, the vertebral column is

[1] See on this doctrine and its recent developments, the work of M. Martius, *De l'unité organique des animaux et des végétaux* (*Rev. des Deux Mondes*, June 15, 1862).

developed under the form of the skull. I go farther; without these harmonious relations, the transformations, repetitions, symmetries, connections, and analogies are nothing but purely material, anatomical facts, that tell the mind nothing. By omitting or setting aside the idea of function, the school of G. St. Hilaire would sacrifice physiology to anatomy, and would suppress in some sort the idea of the living being, in order to see only the number and arrangement of the parts—the material of life in place of life itself; for what is life, if it be not function and the co-ordination of functions?

To sum up: Cuvier's idea and that of G. St. Hilaire are in no way irreconcilable; and Gœthe could profoundly say: 'The naturalists that are followers of Cuvier and of Geoffroy seem to me to be soldiers digging mines and counter-mines; the one party dig from without inwards, the others from within outwards. If they are clever, they must meet in the depths.'[1]

As regards final causes, the theory of G. St. Hilaire is no more against them than that of Cuvier; only the one attaches itself to what we have called the finality of plan, the other to the finality of use.[2] Unity of plan is as conformable to the idea of a primordial wisdom as utility of organs; and it is no easier for a blind nature to make a well-designed animal than to make adapted machines.

[1] *Scientific Works* of Gœthe by Ernest Faivre (Paris, 8vo, 1812), p. 371. M. Faivre likewise shows by examples how the two principles may be reconciled.

[2] See above, Book I. chap. v.

FINAL CAUSES IN THE SANKHYA PHILOSOPHY.

(BOOK I. CHAP. V. PAGE 157.)

THE quotation inserted in the text gives us occasion to make known a beautiful and original application of the principle of final causes in the Hindu philosophy. We find it in the exposition of the Sankhya system made by M. Barthélemy St. Hilaire.[1]

Ordinarily, the final cause, from Socrates to Leibnitz, has served to prove the existence of God. In the system of Kapila, which is called the atheistic Sankhya (in opposition to the system of Patandjali, or the theistic Sankhya), final causes are employed to prove the existence of the soul.

'The soul exists, it is said in the Sankhya Karika,[2] because this vast assemblage of sensible things only takes place for the use of another (*consociatio propter alius causam fit*).'

We see that the point of departure of the argument, as in the physico-theological argument, is the order, harmony, and combination of material elements. Only, in place of inferring the existence of an ordaining being, there is inferred the existence of a being that serves as the end of the combination; and that being is the soul. The major premiss is not: Every work supposes a worker,—that is, some one that has made it,—but: Every work supposes some one for whom it has been made. This major is proved, as in the schools of the

[1] *Mémoires sur la philosophie Sankhya*, by Barthélemy St. Hilaire (*Mémoires de l'Académie des Sciences Morales et Politiques*, tome viii.).

[2] The *Sankhya Karika* is an abridgment in verse of the doctrine of Kapila. We have besides the *Sankhya Pravachâna*, which is attributed to Kapila himself. M. Barthélemy St. Hilaire has given us a French translation of the Karika, and M. Lassen a Latin translation. Besides, Mr. Wilson, in an essay of which M. Barthélemy St. Hilaire has largely made use, has given us the translation of a Hindu commentator of the Karika, named Gaoudapada, belonging to the 8th century of our era.

west, by examples borrowed from human industry: 'A bed supposes some one *for whom* it is made; so also the body is made *for the use* of some one.'[1]

Another argument, analogous to the preceding, and which is another form of it, serves again to prove the existence of the soul: 'There must be a being to enjoy things; *esse debet qui fruitur*,' which is explained in the commentary by these words, 'Things are made to be enjoyed; things visible to be seen. There must be a guest to taste the flavour of the dishes.'

What, then, is the part of the soul in nature? It is 'a witness, an arbiter, a spectator; *testis, arbiter, spectator*.' It is, says the commentator, 'like a beggar that passes through life, like a traveller who removes without remaining in the place he visits, like the ascetic who contemplates the toils of the villager without taking part in them.'

We perceive the character of this strange system taking shape. While in the Western philosophy the principle of final causes is employed to prove the existence of an active and productive cause, here it serves to prove the existence of a *contemplator* who is present at the spectacle of the universe, without mingling with or acting in it.

The soul, according to the Hindu philosophy, is essentially inactive, and the body is essentially insensible. It is by its union with the body that the soul appears active; it is by its union with the soul that the body appears sensible. 'The body,' says the commentator, 'appears sensible without being so; as a vessel filled with a warm liquid appears warm—with a cold liquid appears cold. . . . The soul appears active without being so; as a man mixed with thieves, without being one himself, appears culpable and is not.' 'It is,' says the Karika, 'the union of the lame and the blind.'

We see the reason of the union of the soul with the body, or with nature. By this union nature has an end and a reason of being; by it the soul becomes self-conscious.

[1] It would even seem that this is the true form of the principle of final causes; for to say, 'Every work supposes *a worker*,' is to infer the efficient rather than the final cause. It is more exact to say, like the Hindus, 'Every combination supposes *an end*;' but then, to conclude by a second principle, 'All that is made for an end supposes a worker, that is to say, an intelligent cause.' (See Preliminary Chapter.)

'The soul, in becoming united to nature, has only a single object, to contemplate and to know it; this knowledge is the condition of its safety. To contemplate nature is to enjoy it. Nature would be without an end, if there were not a being to enjoy and contemplate it. . . . Without the soul that knows and thinks, nature would be as if it were not; without nature, the soul in its isolation would be next to a nonentity. By their union, the universe lives and exists, and the soul becomes self-conscious.'

But if nature is made to be contemplated by the soul, is the soul made exclusively to contemplate nature? No, beyond doubt; on the contrary, 'there comes a moment when the satiated soul desires to be delivered from the bond that fetters it; but this deliverance can only take place after having been first united to nature. . . . The evolution of nature has thus no other end than the liberation of individual souls, and therein nature acts for another as if it acted for itself.'

Hence an admirable theory, that of the disinterestedness of nature, that only works for another than itself, and without receiving anything in return. 'Nature only acts to bring about the liberation of the soul; but the soul yields nothing to nature, which acts for another disinterestedly. It is like a person who should neglect his own affairs for those of a friend. If it concerned itself alone, nature would remain inert; but for the soul it displays an indefatigable activity.'

However, this theory of an unconscious activity of nature working in the interest of the soul gave rise to a great difficulty. On the one hand, How, in short, can nature, being blind, apply itself to procure the good of the soul? on the other hand, How can the soul, being inactive, act on nature? The Hindu philosophy here met, under a very special form, the great problem of the union of soul and body, of nature and spirit. By this means the theistic idea, till then very much hidden, was introduced into the Sankhya philosophy. Nature needs, not a worker, but a guide. It is evidently, again, the principle of final causes that has produced this consequence. 'Whether the evolution of nature takes place for nature itself,' says a Hindu commentator,[1] 'or takes place for

[1] *Vatchespati Misra.* See Wilson, p. 168.

another, it is always an intelligent principle that acts. Nature cannot be without rationality, and there is necessarily an intelligent being that directs and dominates nature. Souls, all intelligent though they are, cannot in their individuality direct nature, because they do not know its proper and essential character. There must, then, be a being that sees all things and that is the sovereign of nature; there must be a God (Isvara).'

But this interpretation is comparatively recent, and in the Sankhya of Kapila, nature, as in Aristotle, is unconscious; it acts for the best, without knowing what it does. 'As the action of milk, that knows not what it does, is the cause of the growth of the calf, so the action of nature is the cause of the liberation of the soul.'—'Nature is in itself incapable of enjoying; it is like the transport of a load of saffron by a camel.'

In whatever manner this predetermination of nature to the deliverance of the soul is made, it still holds—and this is the capital point of the Hindu doctrine—that nature has not its end in itself, and that it only exists in the interest of the soul. At this point occurs the passage quoted in our text (Book I. chap. v. p. 157), as well as several not less charming, and which mean the same thing:

'As a dancer, after having shown herself to the assembly, ceases to dance, so nature ceases to act after having manifested itself to the mind of man.' The commentary adds: 'Nature seems to say to man, "See what I am; thou art other than me."'—'Nothing more timid than nature; and when once she has said to herself, "I have been seen," she does not expose herself a second time to the view of the soul.' —'Nature, when once her fault has been discovered, no longer glides under the eyes of man, and hides herself like a woman of good family.'[1]—'"She has been seen by me," says the spectator to himself. "I have been seen by him," says the nature that ceases to act, "and there is no more motive for creation."'

All these texts have the same meaning. Nature, in the

[1] There is a dispute among Hindu commentators on the meaning of this thought. The most probable is, that for nature it is a sort of fault to let itself be seen.

Hindu philosophy, has but one reason of being, one end—to be contemplated by mind, and, in giving it self-consciousness, to lead it to liberation and salvation. There is here, as it seems, a sort of vicious circle. For if the soul has need to be delivered, it is because it is bound; and if it is bound, it is because it is united to nature; so that if nature were not, the soul would have no need to be delivered. But although we do not find in the texts the explanation of this difficulty, we may yet be allowed to think that the soul without its union to nature would remain in the enveloped and unconscious state, that union with nature is necessary to give it self-consciousness by the contemplation and knowledge that it takes of it, by the distinction of the *me* and the *not me*. 'Nature seems to say to man, "This is what I am; thou art other than me."' But this consciousness that the soul takes of itself is for it the first step of deliverance. It learns to distinguish itself from nature, to oppose itself to it, to raise itself above it; and thereafter nature has nothing more to teach it, nor to do for it. 'They might be called a creditor and debtor who have squared their accounts.'

Let us add, to complete this theory, that liberation in the Hindu philosophy has two degrees: in this life, and after death. In the first case, the soul, although free, and become indifferent to nature, remains united to the body, 'as the potter's wheel still turns after the action that had set it in motion.' In the second case, the soul separates from the body, and, the end being attained, nature ceases to act. It is then that 'the mind obtains a liberation that is altogether definitive and absolute.' This supreme state the Buddhists afterwards called Nirvâna, on which so many controversies have been raised.

To sum up: the entire system of the Sankhya rests on the idea of the final cause. But in place of conceiving a supreme cause that acts with intelligence for an end, it is this intelligent and unconscious nature that tends towards an end. Thus the Sankhya approaches the philosophy of Aristotle. But while in Aristotle nature has as its object God or the pure act, in the Sankhya it has as its object Soul and the soul of man. While, according to Aristotle, it is an instinctive desire, and in some sort for its own satisfaction, that nature is developed,

in the Sankhya philosophy it is in the interest of another, in the interest of the soul, that this development takes place. No doubt one might push the approximation farther, and maintain that the contemplation, which is for Aristotle the final term of activity, corresponds to the deliverance of the soul in the Sankhya. But this would perhaps be to press the approximations too far. There will still remain the difference, that for Aristotle nature has its own value, its reality, while for the Hindu philosophers it is only a spectre, a sport, and, as the Vedantists would say, an illusion, *maya*. Thus there will always be ground to distinguish between the realism of Aristotle and the Hindu idealism; but the analogies we have noticed are nevertheless very striking.

VI.

OPTIMISM.—VOLTAIRE AND ROUSSEAU.

(BOOK I. CHAPTER VI. PAGE 247.)

THE question of Evil only touched our subject indirectly, and we required to pass it by, otherwise it would have absorbed all the rest. Our aim was principally to seek in the universe wisdom, not goodness, leaving this latter question to theodicy properly so called. However, not to neglect it entirely, independently of some views set forth in the text, let us here recapitulate the great debate raised on this question in the 18th century between Voltaire and Rousseau. Nearly everything of most weight that can be said for and against Providence is to be found collected in this famous controversy, in which Kant was indirectly mixed up.

The subject of debate is the doctrine of optimism professed by Pope in his *Essay on Man*. According to the English poet, in nature *all is good;* and his poem, in this respect, is only the poetic translation of the philosophic doctrine of Leibnitz, who in his *Theodicy* affirmed, as is known, that 'the world as it is, is the best of all possible worlds.' Pope says just the same thing in this passage:

> 'All Nature is but Art unknown to thee;
> All Chance, Direction which thou canst not see;
> All Discord, Harmony not understood;
> All partial Evil, universal Good:
> And spite of Pride, in erring Reason's spite,
> One truth is clear, Whatever is, is right.'[1]

These affirmations excited in England a keen controversy, with which we shall not meddle. Pope was accused of impiety, as Montesquieu had been of atheism and fatalism. Warburton defended him; Bolingbroke and Shaftesbury took the side of his

[1] *Essay on Man*, Ep. i. p. 289.

doctrine. This whole philosophic quarrel had been forgotten when there occurred a lamentable event, one of those disasters to which humanity is always exposed, and which always take it by surprise—the earthquake of Lisbon in 1755.

In our climes, so rarely visited by this scourge, men were confounded to learn that a vast subterranean wave had shaken Spain, Africa, Italy, and Sicily. In a few hours Lisbon was overthrown, and almost completely destroyed; and, a fire being added to the disorder of nature, from 50,000 to 60,000 people perished. The following is the account given immediately after the event by the *Gazette of France* (No. 567, November 1755):—'We have been informed by a courier from Lisbon, that on the first of this month, about nine in the morning, the earthquake was felt there in a terrible manner.. It overthrew the half of the city, all the churches, and the king's palace. Happily, no accident happened to the royal family, which was at Bebun, though the palace they occupied there was injured. When the courier left they were still in huts, sleeping in coaches, and had been nearly twenty-four hours without servants, and without almost anything to eat. The part of the city not thrown down has taken fire, and was still burning when the courier left. . . . People allege that 50,000 inhabitants have perished in Lisbon.'

Let us also quote the poetical and eloquent passage in which Gœthe has related the same event: 'On the 1st of November 1755 occurred the earthquake of Lisbon, and spread over the world, accustomed to peace and tranquillity, a tremendous terror. A great and splendid capital, which was also a commercial city, is suddenly overtaken by a most dreadful calamity. The earth quakes and moves, the sea boils, the ships collide; houses, churches, and towers fall down; the royal palace is partly swallowed up by the sea. The cleft earth seems to cast forth fire and flames, for on every hand fire and smoke proceed from the ruins. Sixty thousand persons, who the moment before were enjoying tranquillity and the pleasures of life, perish together, and the happiest is he who has not been allowed to foresee and to feel the calamity. . . . Thus nature seems to manifest on all hands its boundless power.'

Such was the event that moved and inflamed the imagina-

tion of Voltaire, and inspired his poem on the *Earthquake of Lisbon*, one of his finest works. It is entirely a philosophical poem, directed against Pope's *All is good.* He successively passes in review all the explanations of this fatal event that can be given to justify Providence, and states his objections to them.

1. The first explanation of the evil consists in saying that it is a chastisement, an expiation. But the expiation of what? For every one is smitten indiscriminately, the innocent as well as the guilty:

> 'Will you say, while this mass of victims you behold:
> God is avenged; their death but pays their crimes?
> What crime, what fault have these poor infants done,
> Laid crushed and bleeding on the maternal breast?
> Was Lisbon, now destroyed, more given to vice
> Than London or Paris, immersed in luxury?
> Lisbon is swallowed up, in Paris still they dance.'

2. It is a great mystery, and the explanation is certainly insufficient. But Pope, like Plato, Leibnitz, and Malebranche, has given another: 'Evil,' he has said, 'is the effect of general laws, to which God behoves to submit, for He has made them.' If this is a profound explanation, it is very hard for the human species:

> 'Do you say, It is the effect of lasting laws
> That necessitate the choice of a free and good God?
> *All is well*, you say, and *all is necessary.*
> What! would the universe, without this hellish gulf,
> Without engulfing Lisbon, would it have been worse?
> . . . . .
> Has not the Eternal Artist in His hands
> Infinite means all ready for His plans?
> I humbly do desire, not to offend my Master,
> That this dark burning gulf of sulphur and saltpetre
> Its flames had kindled in the desert's heart;
> For I respect my God, but love the universe.'

3. Pope had further said that the world forms a systematic whole, in which each detail, each stone and blade of grass, is like a ring in an immense universal chain: the smallest ring removed, the whole chain is broken. Voltaire sees nothing but fatalism in this explanation:

> 'God holds the chain in hand, and is Himself not chained;
> All is arranged by beneficent choice.
> Free is He; He is just, and not implacable.
> Why, then, do we still suffer under a just Master?'

Thus the theory of the concatenation of beings, the εἱμαρμένη of the Stoics, a theory that remains the same with Providence and with fatalism, is only in Voltaire's view a fatalist theory. He renews the dilemma of Epicurus: either God could, but would not, prevent evil, and then He is wicked; or else He could not, and then He is impotent.

4. Another explanation is that there is no absolute evil, and that nature proceeds by compensations: such an evil produces such a good. Voltaire does not admit this principle of compensations:

> 'Would the sad inmates of those regions spoiled,
> In all their anguish, would they be consoled
> If one said to them, "Fall, and calmly die,
> For the welfare of the world; your houses are destroyed,—
> Other hands will build your burnt-down palaces;
> The North will richer grow from all your fatal loss;
> Your ills are all a good, viewed under general laws"?'

And further on:

> 'This evil, as you say, is another being's good;
> And from my gory corpse will a thousand insects rise.
> When death completes the ills I have endured,
> There is this fine solace, to be devoured by worms!
>
> . . . . .
>
> Console me not, I pray; you aggravate my pains.
> And I can only see in you the vain attempt
> Of a proud wretch feigning to be content!'

5. It has been said, again, that God being an omnipotent Master, we ought to submit to His will, and even to His caprices. Pope repeats, after St. Paul: 'The vessel does not ask the potter why he has made it coarse.' Voltaire replies as follows:—

> 'The vessel, we well know, does not the potter ask,
> "Why, then, am I so vile, so feeble, and so coarse?"
> It has no power of speech, nor has it power of thought.
> This urn, which in formation broken falls
> Out of the potter's hand, received no heart,
> That it might good desire and feel calamity.'

The metaphor, in effect, is unjust: I protest, I cry, which the vessel cannot do.

6. Then follows the Christian explanation by redemption: Evil comes from sin, and redeems sin. Here again Voltaire triumphs:

> 'A God came to console our much afflicted race;
> He visited the earth, and yet did it not change.

> An arrogant sophist tells us that He could not;
> He could, the other says, but only He would not.
> No doubt but that He would; and while they reason thus,
> Internal fires have swallowed up Lisbon.'

Redemption has left the world as it was, and can only have its effect in the other world.

Should Voltaire's conclusions after these objections be entirely sceptical? Having opposed, with perfect good sense, the excesses of optimism, must he be regarded as a partisan of pessimism?

No; he explains, he does not wish to excite to revolt, but he finds himself in presence of an enigma of which he seeks the key with pain, but without impiety.

'The author of the poem on the calamity of Lisbon does not oppose the illustrious Pope,' says Voltaire in his preface. 'He thinks with him on all points; but, affected by the misfortunes of men, he protests against the abuse that may be made of this maxim, *All is good.* He adopts the sad and ancient truth, *that there is evil on the earth;* he declares that the saying *All is good*, taken absolutely, and without hope of a hereafter, is only an insult to the sorrows of life.'

His poem is thus rather a vindication of a compensating hereafter than a plea against Providence:

> 'We have need of a God to speak to mortal men;
> It but belongs to Him to interpret His work.
>
> . . . . .
>
> *One day all will be well,* this is what is our hope;
> *All even now is well,* this is illusion.
>
> . . . . .
>
> I do not against Providence rebel;
> I can but suffer without murmuring.'

What other conclusion can be come to on the question of evil? Voltaire's objections are rather religious than impious. He does not exclude Providence, but claims to hope; so that the sum of this debate is that every one is agreed; and J. J. Rousseau will be found to conclude likewise.

But before analyzing the pages in which this powerful writer has criticised Voltaire's poem, let us recall the opinion of a great philosopher, Kant, who, then thirty years old and a professor in the University of Koenigsberg, was moved, like all the world, by the disaster of Lisbon. He said his say on

the question engaging us, in two untranslated writings—the one geological, the other purely philosophical. The first is entitled, *On the Earthquake of Lisbon* (1756); the other, *On Optimism*, and appeared in 1759.

To his treatise on the earthquake of Lisbon, Kant had added a preamble, containing considerations favourable to optimism. He there set forth the moral utility that man could derive from those catastrophes. They, in effect, remind him that all is not made for him on the earth, and that he himself is not made exclusively for the earth. He ought, therefore, to look beyond, and think that all his being is not destroyed by death. In these observations, Kant already rises above Pope and Voltaire: 'The consideration of these terrible events is,' he says, 'instructive. It humbles man by making him see that he has not the right, or at least has lost the right, to expect from the laws of nature ordained by God consequences always agreeable to him; and perhaps by this means he also learns that this arena of his passions ought not to be the end of all his thoughts.' Such are the two lessons that these scourges teach us. Kant then develops the point of view of compensations, not in the superficial sense that evil is compensated by good, and may be annulled thereby, but in the sense that particular evil is only an insignificant consequence of general utility. He forms in some sort the theory of earthquakes from the point of view of human utility. Whence come these famous phenomena?—From the internal fire, which is the very condition of the existence of living beings on the earth. Suppose the earth refrigerated, as the moon is said to be, and life will at once cease on our planet. To prevent this general evil, there must be accidentally produced evils—deadly, indeed, but particular and exceptional. That the earthquake should only occur in deserts is an impossibility so much the more absolute, that the internal fire is necessary for human industry. We must, then, accept this necessity, and, to repeat a word as true as commonplace, bear what cannot be prevented.

'One is scandalized,' says Kant, 'to see so terrible a scourge for the human race considered from the point of view of utility. I am convinced that this utility would willingly be renounced if we could be freed from the fear and danger attached to it.

We have an unreasonable pretension to an absolutely agreeable life, and would have the advantages without the inconveniences. Men born to die, we cannot bear that some have died in an earthquake; strangers here below, and having no possession, we are inconsolable that earthly property is lost, property which would have perished of itself, in virtue of the universal laws of nature. It is easy to understand that if men build on a soil composed of inflammable materials, sooner or later all the magnificence of their structures must be overthrown by earthquakes. But should one, therefore, seem impatient towards the ways of Providence? Would it not be wiser to say, It was necessary for earthquakes to happen from time to time, but it was not necessary to build magnificent dwellings there?'

It is for us to foresee disasters, and prevent them if we can, by adapting our structures, for example, to the nature of the soil.

'Although the cause that produces earthquakes,' continues Kant, 'is deadly to man in a certain point of view, in others it recompenses this evil with usury. We know, in effect, that the warm springs that are so useful to man's health owe their mineral properties and their heat to the same causes that cause the earth to quake. . . . If this be so, as we cannot but admit, we will not object to the beneficent effects of this subterranean fire, that communicates a gentle warmth to the earth when the sun refuses his, and that contributes to favour the vegetation of plants and all the economy of nature. In view of so many advantages, are the evils that may happen to the human race, because of this or that disaster, of such a nature as to absolve us from the gratitude we owe to Providence for its other benefits?'

The true force of this line of argument evidently consists, not in saying that this evil is compensated by that good, but that this evil is an accident connected with a general cause, without which there would have been no good.

Kant's second writing, *On Optimism*, is exclusively philosophical. The philosopher here essays to reply to an entirely metaphysical objection to optimism. There cannot, it is said, be a *realized maximum*. Thus the greatest number possible cannot be realized; every real number can always be aug-

mented. The *maximum* is a virtuality impossible *in actu.* How, then, could there be a world that should be the *best possible?* The world, being finite, is necessarily imperfect; no doubt it may always be less and less imperfect, but without ever being able to reach a fixed limit beyond which a better could not be conceived. It is the objection that Fenelon had brought against Malebranche, the conclusion of which is, that there is no best possible world in itself, and that if this world exists, and no other, it is because of the free choice of God.

The objection rests on a confusion that Kant mentions at the first, by distinguishing the *optimum* of a world from the *maximum* of a number. There is contradiction for the *maximum*, but not for the *optimum.* Quantity is of quite a different nature from quality. The maximum of quality exists, and God Himself is the *optimum* in itself. No doubt, the world cannot be God; but, exclusive of this sole condition, it can realize the relative *optimum*—in other words, be the best possible.

'Without,' says Kant, 'insisting on this point, that the degree of reality of a thing is not suitably conceived in relation to an inferior degree, by comparing it to the relation of a number to its units, I shall content myself with the following consideration, to show that the proposed instance is not applicable here. There is no greatest number possible, but there is a highest degree of possible reality; and that degree is found in God. The conception of the greatest possible finite number is the abstract conception of plurality in general, which is finite, which, however, can still be added to without it ceasing to be finite; in which, consequently, the fixity of greatness places no determinate limit, but only limits in general, because of which the conception of the greatest possible cannot be applied as predicate to any number. For if any determinate quantity be thought of, one can still add a unit without prejudice to the character of finite that belongs to it. On the other hand, the degree of reality of a world is absolutely determinate; the limits of a world the best possible are not only set in a general or abstract manner, but set by a degree it must absolutely come short of. Independence, the attribute of self-sufficiency, omnipresence, power to create, are perfec-

tions that no world can have. It is not here, then, as in the mathematical infinite, where the finite indefinitely approaches the infinite, according to the law of continuity. Here the interval between infinite and finite reality is set by a determinate greatness that makes their difference. The world that is found at that degree of the scale of beings where the abyss opens that contains the incommensurable degree of perfection, that world is the most perfect among all that is finite.'

There would thus be a limit beyond which there is only absolute perfection. I know not whether Kant, twenty years later, would have been fully satisfied with this passage. It even appears that he did not much like to be spoken to about this work. It is not the less true that his penetrating mind has justly signalized the difference between *optimism* and the *maximum*—the one having no limit, while the other may have.

Let us now come to Jean-Jacques Rousseau. Voltaire had sent him his two poems on natural law and the disaster of Lisbon; and in his letter of thanks, while expressing his admiration, Rousseau made his reservations with that independence that is not always agreeable.[1] Voltaire was stung to the quick, and from this moment the rupture was complete between the two philosophers, already embroiled with regard to the theatre of Geneva.

Rousseau first opposes to Voltaire a sentimental reason, in which he conforms to the general spirit of his philosophy. His heart resists the doctrines of the Lisbon poem: they appear to him sad and cruel; they weaken the moral powers. In this respect he prefers the maxim *All is good.* This objection is not entirely just, if one recalls Voltaire's last word, or at least it could not be applied in all its strictness to the Lisbon poem. It would, on the other hand, very well apply to another of Voltaire's writings, his famous *Candide*, a masterpiece of irony and sarcasm, which breathes only contempt of the human race, and is not written with the heart like the Lisbon poem. Here Voltaire submits to Providence, and Rousseau seems to forget this.

'Pope's poem,' he tells him, 'mitigates my ills, and brings me patience; yours aggravates my pains, and excites me to

[1] J. J. Rousseau, *Correspond.* 18th August 1756.

murmur, and, depriving me of all but an enfeebled hope, it reduces me to despair. . . . Tell me who abuses sentiment or reason? . . . If the difficulty of the origin of evil forced you to alter some one of the perfections of God, why seek to justify His power at the expense of His goodness?' At any rate, this is still only an objection of prejudice, resulting from incompatibility of disposition.

Rousseau then seeks for the cause of evil, and finds it, as regards moral evil, in human nature, and as regards physical evil, in nature in general. As for man, having received from God liberty and feeling, he must consequently know evil and sorrow. 'I do not see that the cause of moral evil can be sought elsewhere than in man free, perfected, therefore corrupt; and as to physical evils, if sensible and impassive matter is a contradiction, . . . they are inevitable in every system of which man forms part; . . . and then the question is not, why man is not perfectly happy, but why he exists.' Man, as he is, is composed partly of matter: he is therefore sensible of pain, as of pleasure; for pleasure is only a less pain, as pain is only a less pleasure—they are degrees of a scale.

Further on, Rousseau expresses the same thought as Kant, in adopting the principle of Pope and Leibnitz, who only see in evil an accidental effect of universal laws: 'You would have preferred the earthquake to have occurred in the heart of a desert rather than at Lisbon. Can it be doubted that they also occur in the deserts? . . . What would such a privilege signify? Would it mean, then, that the order of the world must change according to our caprices? that nature is subject to our laws? and that to forbid an earthquake in any place, we would only have to build a town there?'

What strikes and moves us in these great disorders of nature is the suddenness of the scourge and the number of the dead; but this earthquake teaches us nothing new, and we know well that all those who have died at once behoved to die some day. Must they be lamented because their death was sudden? 'Is it a sadder end,' replies Rousseau, 'than that of a dying man, overwhelmed with useless cares, whom a lawyer and heirs do not allow to breathe, whom doctors assassinate in his bed at their ease, and whom barbarous priests skilfully cause to taste death?'

If evil is a consequence of natural laws, it would only be avoided by suppressing nature itself, that is, the very condition of good. In order not to suffer, we must have been incapable of enjoying; in order not to die, we ought not to have been called to live. It is said, I would rather not have been; but it is said from the lips more than from the heart. Most men would rather suffer than die, and these still pronounce in favour of Providence.

'It is difficult,' we read further, 'to find on this point good faith among men, and to calculate all with philosophers; because the latter, in the comparison of good and evil, always forget the pleasant feeling of existence, independent of every other sensation; and the vanity of despising death requires the others to calumniate life, almost like those women who, with a stained robe and scissors, pretend to prefer holes to stains. You think, with Erasmus, that few people would wish to be born in the same circumstances they have lived in; but such a one puts a very high price on his merchandise who would greatly lower it if he had any hope of closing the bargain. Besides, whom am I to believe? The rich, . . . literary people, of all classes of men the most sedentary, the most sickly, the most thoughtful, and, consequently, the most unhappy? . . . Consult a citizen, . . . an artisan, . . . a peasant even,' etc.

Life is good, let us accept the ills of it; such is Rousseau's conclusion on this question.

As to the chain of beings, Voltaire's verse, already quoted, and the notes he had added to his poem, also called for a reply. Change a grain of sand, and you change all; 'but,' said Voltaire, 'is free will compatible with this theory?' That is another question. What is certain is that every cause supposes an effect, just as every effect is determined by a cause. Voltaire, however, does not admit this chain of the world. 'One may,' he says, 'suppress a body without injuring the whole. If a pebble were suppressed, wherein would that injure the universe?'

'A drop of water,' says he in his notes, 'a grain of sand, more or less, can cause no change in the general constitution. Nature has not subjected itself to any precise quantity, nor to any precise form. No planet moves in an absolutely regular curve. . . . Nature never acts strictly. . . . There are

events that have effects, and others that have none. . . . Several events remain without filiation. . . . The wheels of a coach serve to make it go; but whether they raise a little more or less dust, the journey is made all the same.'

Here Voltaire denies the Leibnitzian principle of sufficient reason, and contradicts Spinoza's axiom, '*Ex causa determinata sequitur effectus.*' Rousseau defends against Voltaire this precision, this determination of nature always acting according to mathematical laws, often complex, but not less strict because we cannot grasp them:

'Far from thinking that nature is not subject to precise quantities and figures, I would hold, on the contrary, that it alone strictly follows this precision. . . . As to these pretended irregularities, can it be doubted that they have all their physical causes? These apparent irregularities come, no doubt, from some law we are ignorant of.'

Let us remark, in passing, that astronomy has proved the truth of these assertions, and that the irregularities instanced by Voltaire in the motion of the planets are comprised in Newton's law.

'Let us suppose,' continues Rousseau, 'two weights in equilibrium, and still unequal. Add to the smaller the quantity by which they differ. Either the two weights will remain in equilibrium, and we shall have a cause without effect, or the equilibrium will be broken, and we shall have an effect without cause. But if the weights were of iron, and there were a grain of loadstone hidden under one of them, the precision of nature would then deprive it of the appearance of precision, and, by means of exactitude, it would appear to want it.'

Thus the doctrine, there is no cause without an effect, is as true as the converse; and when a cause does not produce its effect, it is because it is arrested by another cause:

'You distinguish the events that have consequences and those that have none. I doubt the validity of this distinction. . . . The dust a carriage raises can have no influence on the progress of the vehicle, nor on the rest of the world. . . . I see a thousand plausible reasons why it was not indifferent to Europe that one day the heiress of Burgundy had her head well or ill dressed, nor to the destiny of Rome that Cæsar turned his eyes to the left or the right.'

With the same force and dexterity Rousseau maintains against Voltaire the principle of good relative to the whole, and not to a part:

'You tell man, I must be as dear to my Master—I, a thinking and sentient being—as the planets that probably do not feel. . . . But the system of this universe, that produces, preserves, and perpetuates all these sentient and thinking beings, must be dearer to Him than a single one of these beings. . . . I believe, I hope, I am worth more in the eyes of God than the territory of a planet; but if the planets are inhabited, . . . why should I be worth more in His eyes than all the inhabitants of Saturn?' In a word, the existence of a living being is connected with all sorts of laws more precious than that one being.

'But,' says Voltaire, 'the nice comfort of being eaten by worms!' Rousseau replies to this whim, 'That the carcase of a man should feed worms, wolves, or plants, is not, I grant, a recompense for the man's death; but if, in the system of this universe, it is necessary for the preservation of the human race that there should be a circulation of substance between men, animals, and vegetables, then the special evil of an individual corresponds to the general good.'

Drawing to a close, Rousseau ends by coinciding with Voltaire. Rousseau does not deny that there is evil in the world, and Voltaire declares that he meant to say nothing else; so it is only the form that differs:

'To return to the system that you attack, I believe it cannot be suitably examined without carefully distinguishing the particular evil of which no philosopher has denied the existence, from the general evil which optimism denies. The question is not, whether each of us suffers or not, but whether it was good for the universe to be, and whether our evils were inevitable in its constitution. Thus the addition of an article would render, it seems, the proposition more exact; and, in place of saying *All is good*, it would perhaps be better to say, *The whole is good*, or, *All is good for the whole*.'

Thus no one really denies the existence of evil; and if the Stoics appeared to do so, it was in words rather than in deed. Only the question is, Whether this word is absolute or relative, universal or partial; whether it prevails over good, or whether,

on the other hand, good prevails. A question difficult to decide, and which will usually be decided by the feelings and imagination of each one. Good-humoured people are optimists, the bad-humoured are pessimists. La Rochefoucauld said, 'Happiness is in the taste, not in things.' Experience gives us no satisfactory solution, and the question must be decided by *à priori* reasons, as Rousseau again says:

'The true principles of optimism can neither be deduced from the properties of matter nor from the mechanism of the universe, but only from the perfections of God, who presides over all; so that the existence of God is not proved by the system of Pope, but the system of Pope by the existence of God.'

In other words, optimism is the consequence of the existence of God, and cannot be contradicted by experience. The world is as good as it could be, because God cannot be the devil—that is to say, the principle of evil.

'All these questions,' says Rousseau, 'again, are reducible to that of the existence of God. If God exists, He is perfect; if perfect, He is wise, powerful; if wise and powerful, my soul is immortal; if my soul is immortal, thirty years are nothing to me, and are perhaps necessary to the welfare of the universe.'

It is evident that this conclusion is not, after all, very different from that of Voltaire:

> 'One day all will be well; such is our hope.
> All is well here below; this is illusion.'

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THE END.

[*See also next page.*